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OEL Maintenance Manual ML395



Revision 4

Rev	Date	Okidata Corporation Name ML395/395C Maintenance Manual
1	2005-07-08	
2	2006-11-10	
3	2009-02-03	
4	2011-07-08	

History of Revision

[illegible]

PREFACE

This Maintenance manual describes how to maintain the Microline 395/395C printer in the field.

This manual is for customer engineers.

For further information, refer to the User's Manual for handling or operating the equipment.

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1. CONFIGURATION

1.1 Standard Configuration

ML395 consists of the following assemblies:

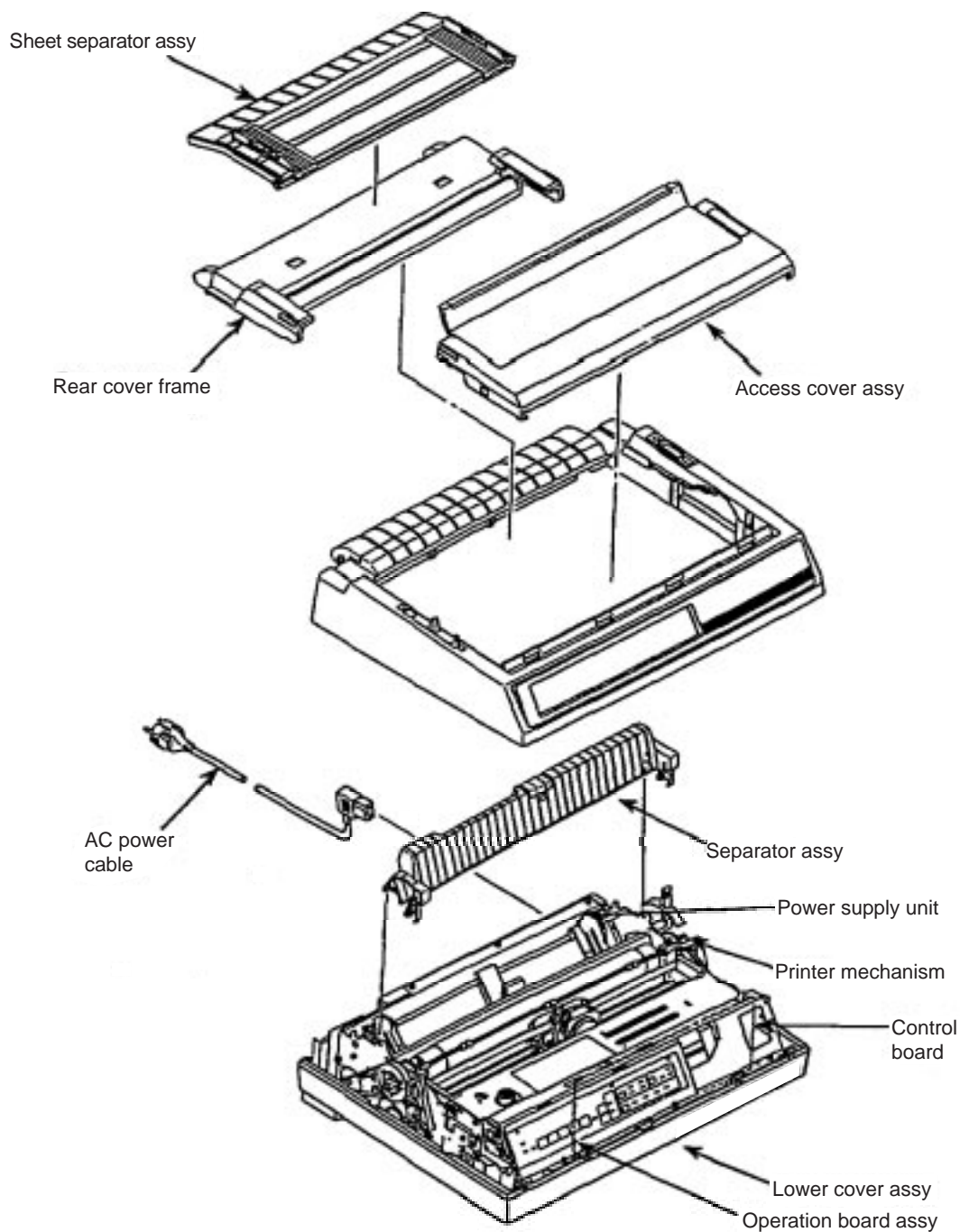


Figure 1-1 Configuration

1.2 Optional Configuration

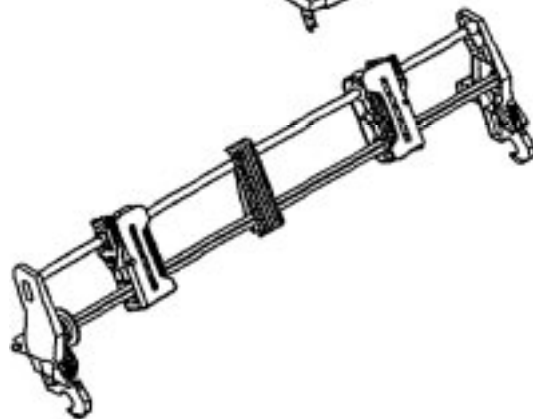
- (1) Single bin cut sheet feeder unit (CSF)



- (2) Dual bin cut sheet feeder unit (D Bin CSF)



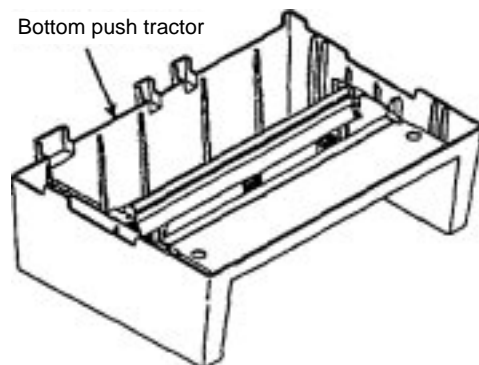
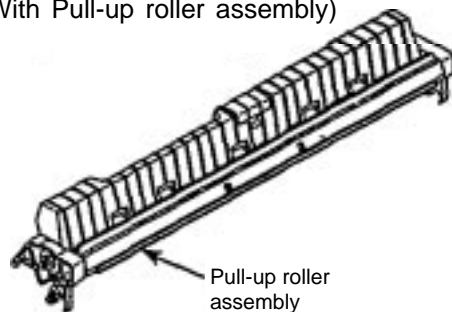
- (3) Pull-tractor unit



- (4) Color printer model (Factory option)

Bottom push tractor

- (5) Bottom-Push Tractor Unit
(With Pull-up roller assembly)



2. EXPLANATION OF OPERATION

2.1 GENERAL

This printer mainly consists of the printing mechanism unit, control unit and power supply unit. The printing mechanism unit consists of the printhead, spacing mechanism, paper feed mechanism and ribbon change mechanism (in color model only).

The control unit is roughly divided into the main control board and personality cartridges.

Each of these components operates as described below.

2.1.1 Printing Mechanism

(1) Printhead

The printhead has 24 wire dot magnets for printing according to the dot pattern generated in the control unit.

(2) Spacing mechanism

A DC servo motor moves the carriage for spacing, tab and CR.

(3) Line feed mechanism

A stepping motor (LF motor) carries out line feeding operation and feeds the continuous paper or single sheets.

(4) Ribbon change mechanism (in color model only)

A stepping motor selects and changes the color ribbons.

(5) Bail open/close mechanism

A stepping motor opens/closes the bail.

2.1.2 Control Unit

(1) Main control board

Two microprocessors (MPUs) control the whole printer via the peripheral LSIs, memory and other circuits.

Interface circuits and various motor driver circuits are also mounted on this board.

(2) Power supply unit

The power supply unit converts the AC input to +5 VDC, +38 VDC and ± 8 VDC.

Figure 2-1 shows the block diagram of this printer.

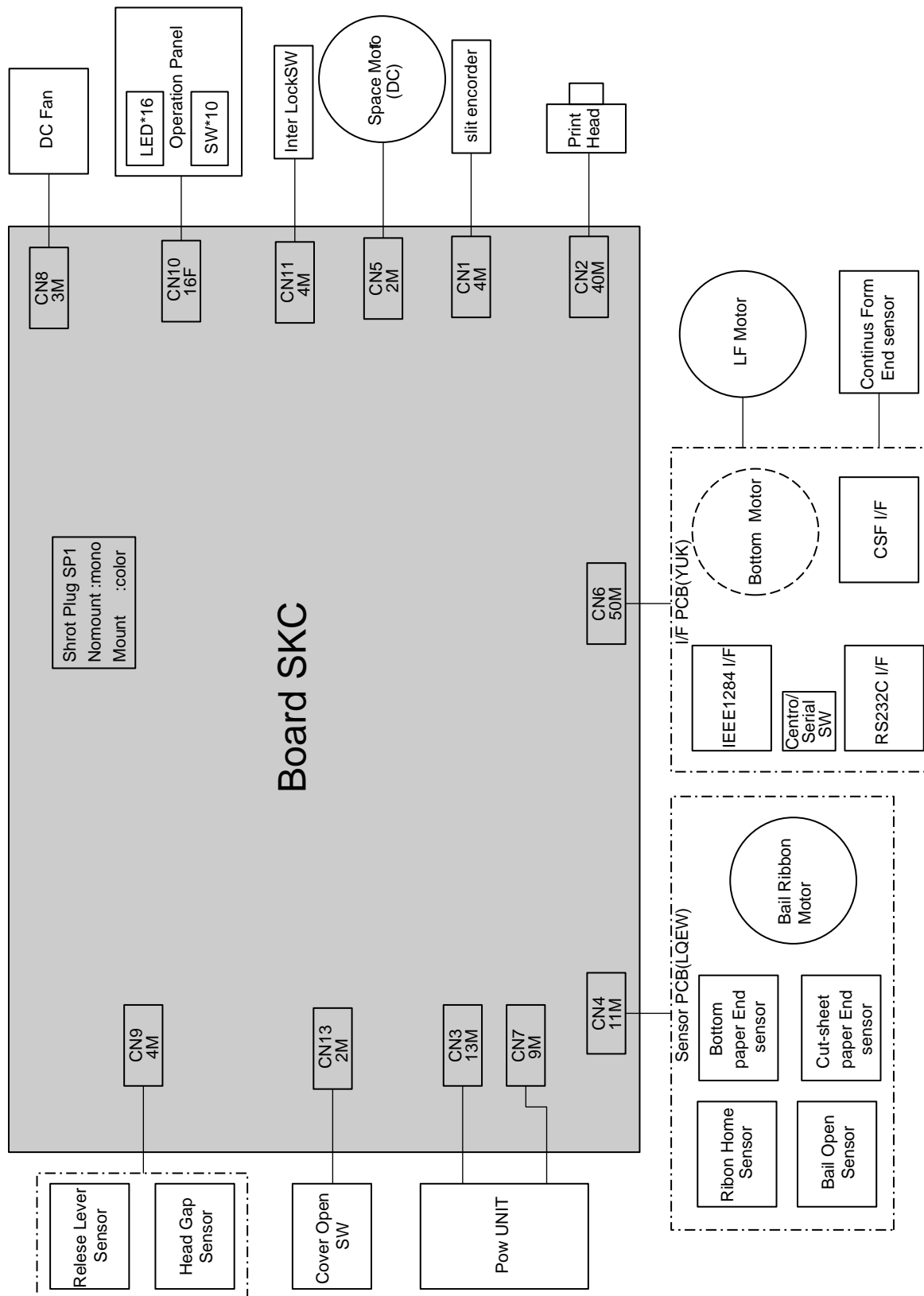


Figure 2-1 Block diagram

2.2 CIRCUIT DESCRIPTION

2.2.1 Summary

The main configuration of this printer is the print mechanism unit and print control unit.

The print mechanism unit can be divided broadly into the print head, space system, paper-feed system, and ribbon-feed system. The operation of each item is listed below.

- (1) Print head Prints with the 24 wire-dot magnet. The dot patterns are configured in the print control unit.
- (2) Space system The stepping motor moves the carriage and performs spacing, tab, and carriage return.
- (3) Paper-feed system ... Paper is fed by the stepping motor.
- (4) Ribbon-feed system . Ribbon is fed by obtaining drive force from the DC motor just as in the space system.
- (5) Print control unit Controls the interface and mechanism with one SOC.

2.2.2 Circuit Operation

The circuit of this printer consists of the control board.

Circuits such as SOC and its peripheral circuits, drive circuits, and the external interface circuit are set on the control board.

With the control board being the main board, the boards are connected by cables.

2.2.2.1 SOC and peripheral circuits

(1) SOC

SOC to be CPU and past LSI function, building SRAM into, and the outline is as follows.

€ 3.3V single power supply (1.2V in internal core voltage)

€ Operation frequency 48MHz

€ Built in CPU core (ARM7TDMI)

€ SRAM 4Mbit

€ With built-in UART function

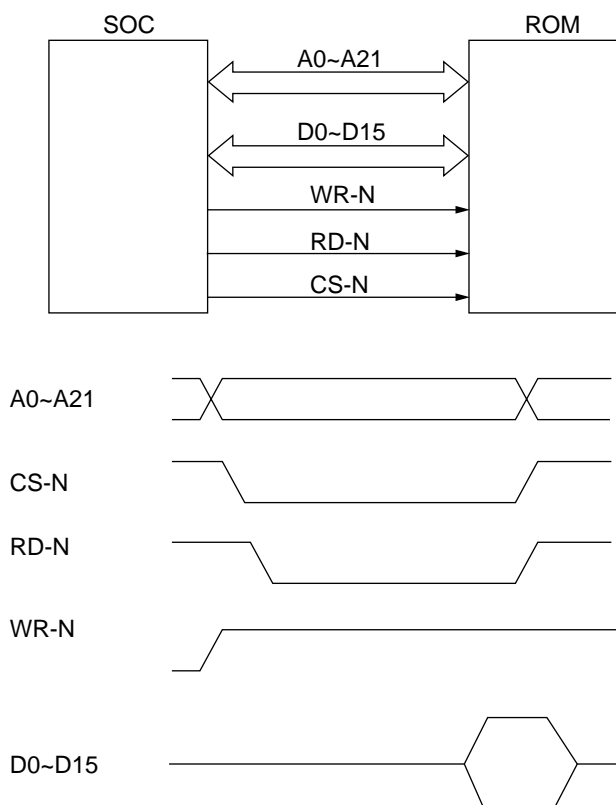
€ AD converter x 4ch, DA converter x 2ch

Other peripheral circuitry is OKI original.

(2) Program ROM (external FLASH ROM)

The program to make the printer work is stored in FLASH ROM as external ROM.

FLASH ROM that can be installed is 64Mbit (16 x 4096k) or less. The access timing of the outline to FLASH ROM is shown in the following.



(3) RAM

In RAM, the memory capacity built into SOC is 256K x 16bit (4Mbit).

2.2.2.2 Initializing operation

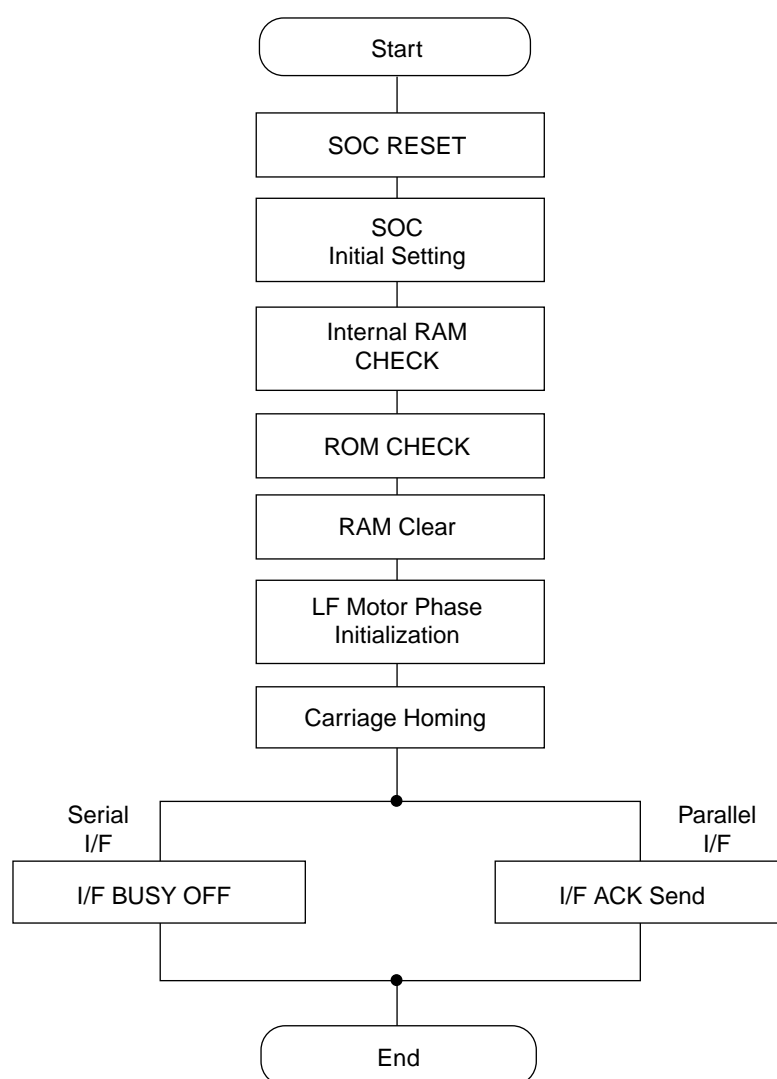
This printer is initialized when the power is turned on or when the I-PRIME-N signal is input from the host side via the parallel interface.

For the initialize operation, the RST-N signal is first output from the reset circuit to reset the SOC and Flash ROM. When resetting ends, the program starts. Reset operation by I-PRIME starts program to initialize, but does not reset the SOC.

The program here sets the mode of the SOC, checks the memories (ROMs and RAMs), then carries out carriage homing, and determines the LF motor phase.

Finally, the program establishes the interface signals (P-I/F: ACK-P signal sending, and S-I/F: BUSY-N signal off) and lights the SELECT lamp to inform the ready state for receiving to the host side and ends the initialize operation.

After USB I/F control I/O initialization and USB I/F bus opening.

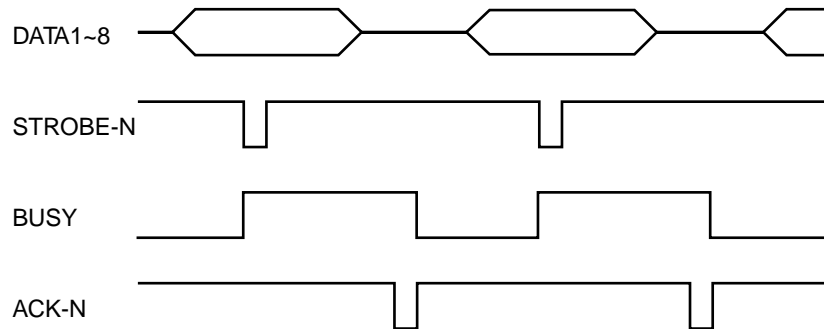


2.2.2.3 Controlling the interface

1) Parallel interface

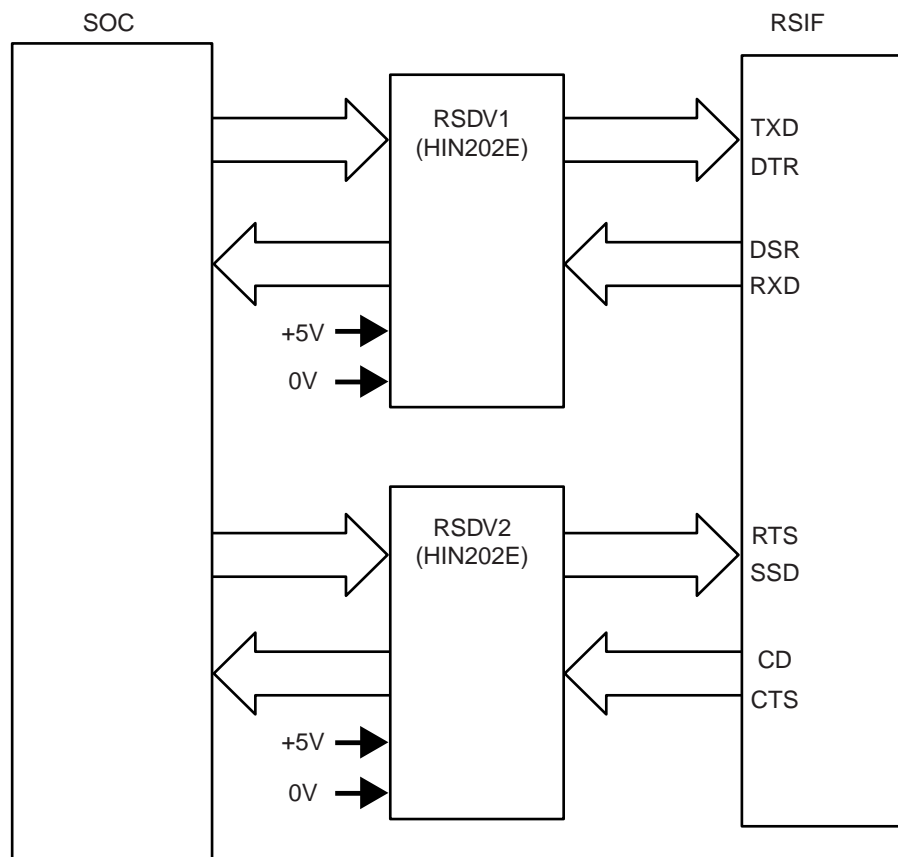
Data from the interface is input from the connector is read in the timing of the STROBE-N signal by the interface, print head, and SOC for motor control.

When this signal is being process, the BUSY signal goes ON. When the process is completed, the BUSY signal goes OFF, sends an ACK-N signal, and waits to receive the next data.



2) RS232-C Serial Interface

This serial interface is capable of transmitting and receiving simultaneously at speeds up to 19,200 bits per second. Two protocols are available: printer Ready/Busy and X-ON/X-OFF modes.



2.2.2.4 Print head control drive circuit

This circuit produces the print timing and drive time from SOC, drives the head magnet that corresponds to HEAD 1~24 with HD01-24-P signal and HD0DDCOM-P/EVENCOM-P signal and prints.

As the print head is dispersed and allocated in each group, the four groups are controlled individually.

2.2.2.5 Spacing

The SoC accelerates and decelerates the space motor. It also controls the space motor speed in each printing mode.

2.2.2.6 Line feed

The LF motor phase signals (LF_PHA, LF_PHB) from SOC are input to the motor driver, which drives the LF motor.

2.2.2.7 Alarm circuit

(1) High-temperature head alarm

The temperature of the head is monitored by a thermistor embedded in the head to protect the head coil.

The head temperature will rise after continuous heavy-duty print jobs. Therefore, when the head rises beyond a specified temperature, a thermal alarm mode will be entered, and after the current line is printed, the speed for printing the following lines will be decreased. Furthermore, if the head temperature does not fall, the following lines will be divided into two depending on the temperature, and printed by single-direction print.

The alarm is detected when the resistance of the thermistor decreases from the rise in the head temperature and SOC is input in the A/D converter.

(2) Driving time of the print head is observed.

The alarm circuit of printhead observes the state that comes for the pin to go out, and turns off power.

(3) Driving time of the motor is observed.

The alarm circuit of motor observes abnormality of the motor, and turns off power.

2.2.2.8 Paper-end detect circuit

This circuit detects the presence of paper.

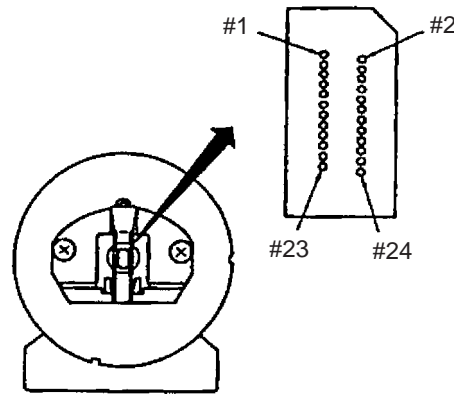
2.2.2.9 Power source unit

The power source unit supplies +38V, +8V, -8V and +5V to each section by switching power.

2.3 EXPLANATION OF MECHANISM OPERATION

2.3.1 Printhead Mechanism and Operation (See Figures 2-2 and 2-3)

The print head is a spring charge type head using a permanent magnet, and is installed on the carriage moving parallel to the platen.



**Figure 2-2 Print head pin arrangement
(View from the front end of print head)**

(1) Printhead operation

The armature is normally pulled to the core by the permanent magnet force against the armature spring force. The wire integrated with the armature is in the reset state. When the magnet coil is excited by the print command from the control unit, a flux in the reverse direction of the permanent magnet force is generated to cause the armature to move away from the core by the force of the armature spring. The wire strikes the platen with the ink ribbon and paper in between to effect printing.

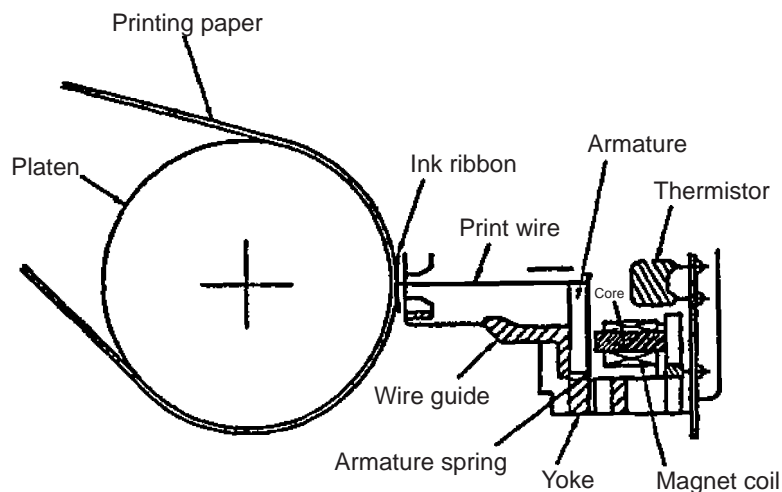


Figure 2-3

2.3.2 Spacing Mechanism and Operation

Spacing is effected by driving the carriage installed on the main shaft and slide beam set parallel to the platen by the DC servo motor.

(1) Spacing operation (See Figure 2-4)

The carriage mounting the printhead moves in parallel with the platen along the main shaft and slide beam. The carriage is fixed to the mini pitch belt under the carriage frame.

When the DC servo motor runs clockwise as viewed from its near side, the driving force is transmitted to the mini-pitch belt and the carriage moves from the left to the right. The DC servo motor rotating angle and speed are controlled by the count of ϕA and ϕB signals (with a phase difference of about 90°) from the encoder and the time intervals of the signals. The rotating direction is determined by the sign (positive or negative) of the phase difference between ϕA and ϕB .

The mechanism is designed so that the carriage moves 1.6 inches (40.64mm) when the DC servo motor makes one revolution.

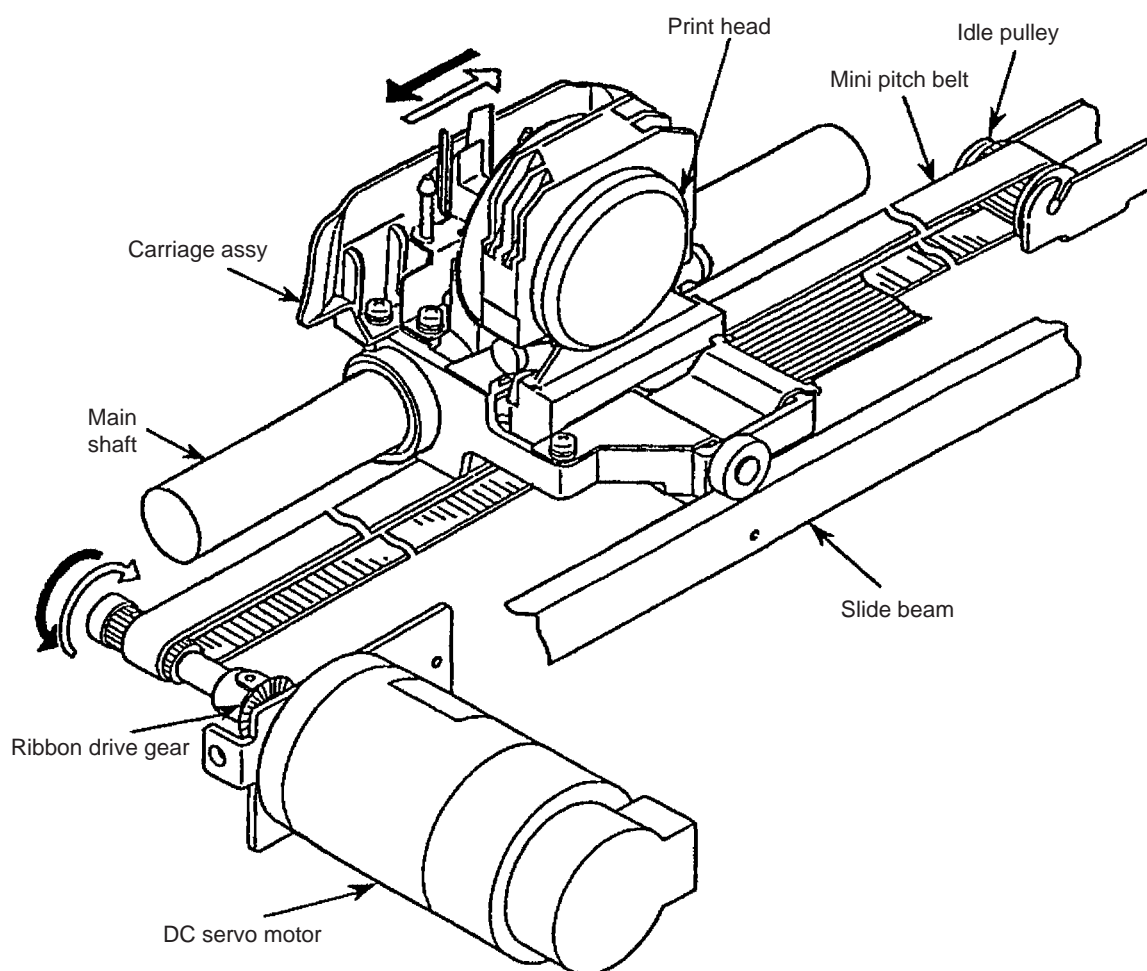


Figure 2-4 Spacing mechanism

2.3.3 Ribbon Feed Mechanism and Operation (See Figure 2-5)

The ribbon feed mechanism feeds the ribbon in synchronism with the spacing operation. The DC servo motor for spacing operation gives the driving force.

(1) Ribbon cartridge

A one-way feed endless ink ribbon is used to constantly obtain clear printing copy.

(2) Feed operation

The ribbon feed mechanism is driven as soon as spacing operation starts although no printing is made and stops after the end of the spacing operation. The space motor rotation is transmitted to the drive roller in the ribbon cartridge via the ribbon feed gear assembly to feed the ribbon.

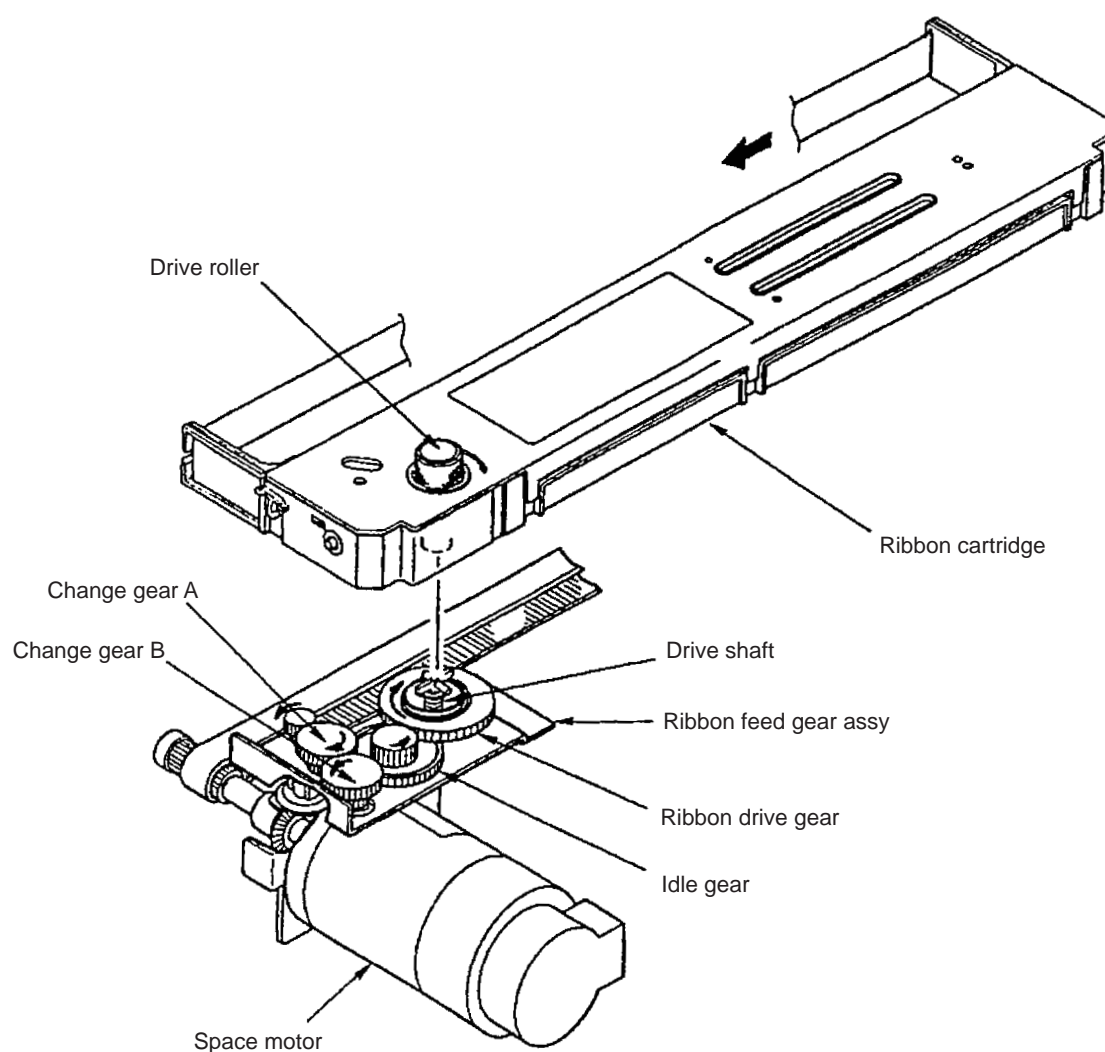


Figure 2-5 Ribbon feed mechanism

2.3.4 Head Gap Adjusting Mechanism and Operation (See Figure 2-6)

The head gap adjusting mechanism adjusts the gap between the platen and printhead.

This adjustment is necessary to obtain the proper head gap for varied paper thickness.

Adjustment is made with the head gap adjusting lever on the right side of the printer mechanism.

The head gap changes as the eccentric cam fixed on both ends of the main shaft rotates.

The adjustment is in 9 stages (1 to 9).

When the paper (for example, copying paper) requires adjusting position 3 or more, the printhead is driven with increased force to improve printing quality. When the adjusting lever is set to position 3 or more, it presses the microswitch which detects the lever position.

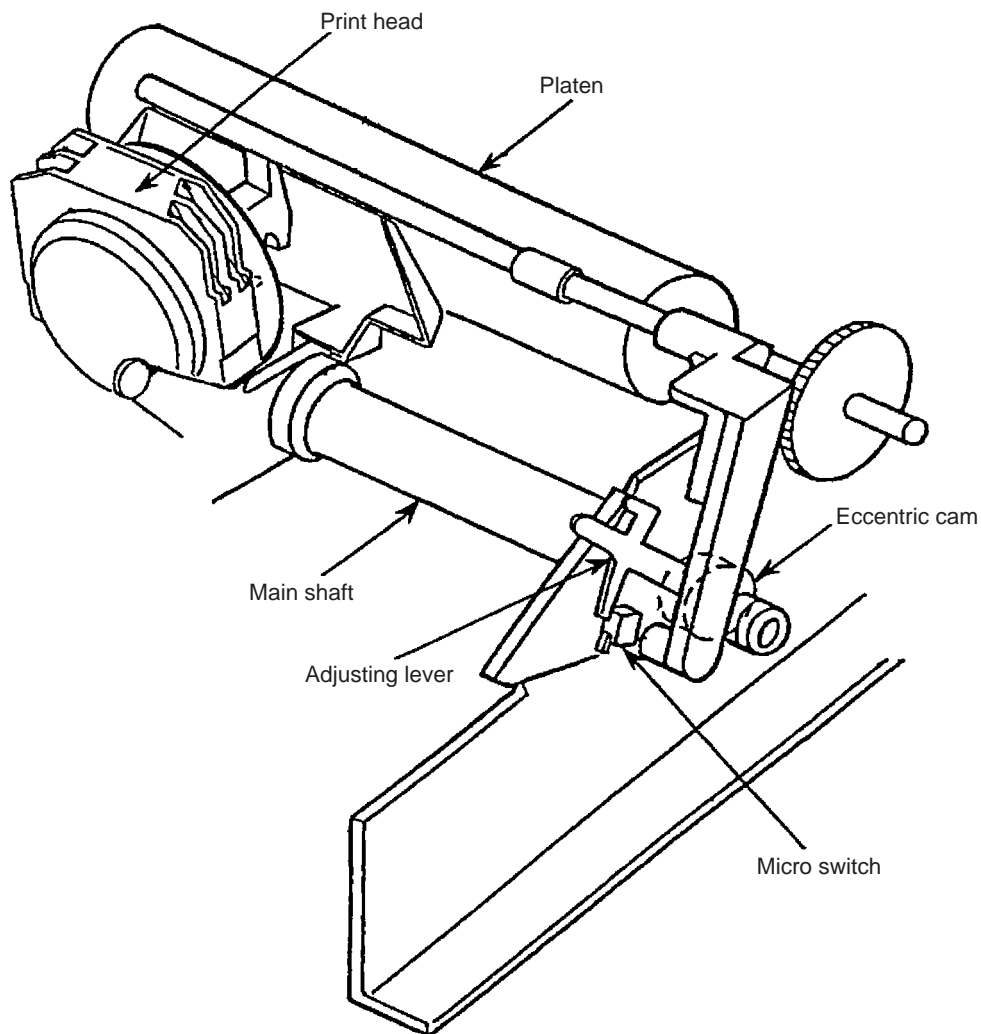


Figure 2-6 Head gap adjusting mechanism

2.3.5 Paper Feed Mechanism and Operation

Line feeding of the printing paper is driven by the LF motor to feed the platen and pin tractor.

(1) Single sheet feeding mechanism (See Figure 2-7)

The LF motor for paper feeding is installed on the left side frame. The motor rotation is transmitted to the platen via the platen pulley.

The mechanism is designed to feed the paper by 0.17 inch (4.23 mm) when the stepping motor rotates 60 steps. The minimum feed rate is for one step of the LF motor or 0.03 inch (0.07 mm).

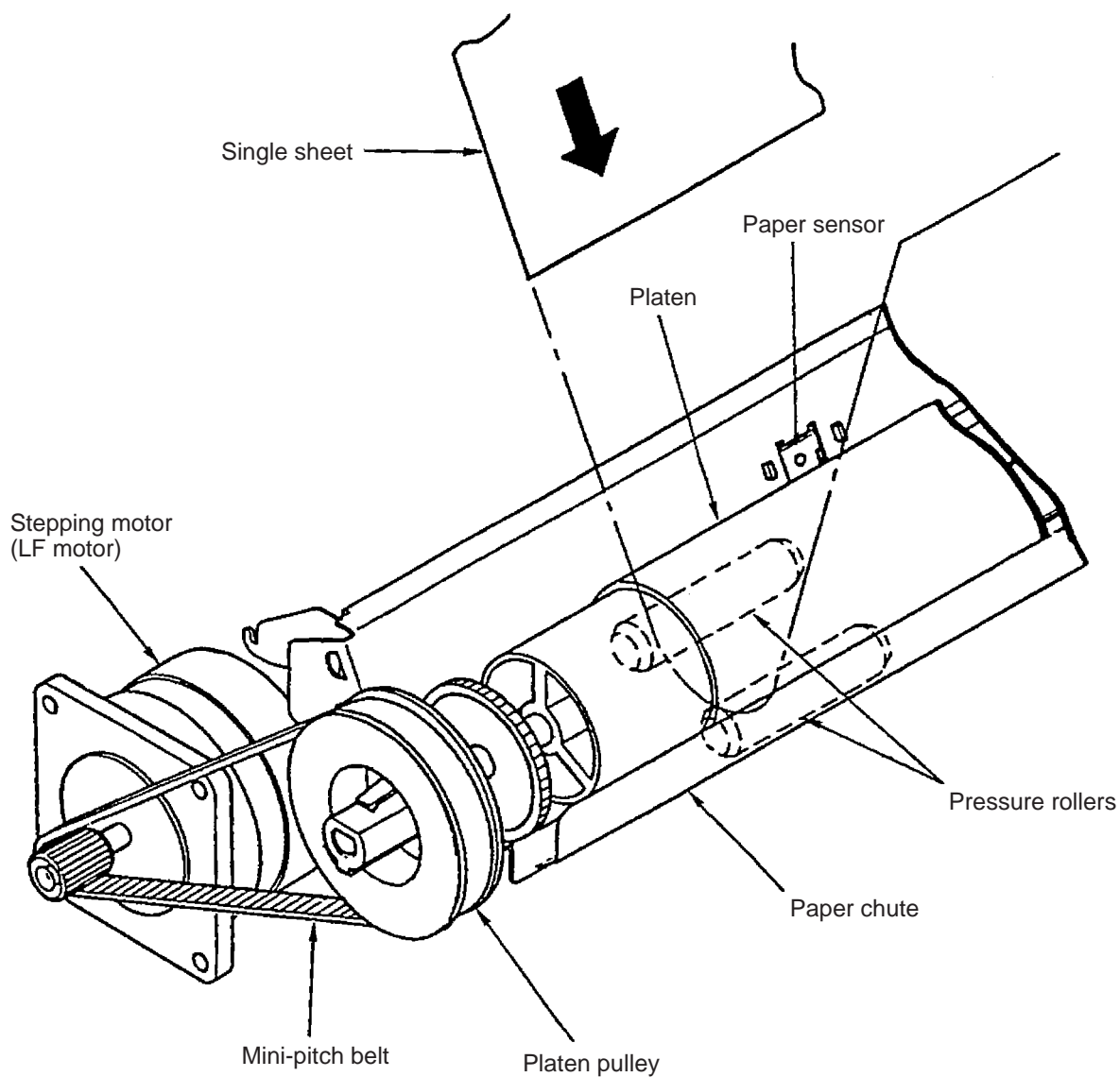


Figure 2-7 Single sheet feeding mechanism

(2) Continuous form feeding mechanism (See Figure 2-8)

The power transmitted to the platen as described in (1) (single sheet feeding operation) rotates drive gears A and B by way of the platen gear at the right end of the platen and the idle gear.

As drive gears A and B rotate, the pin wheels and pin tractor belts are rotated via two sheet feeder shafts to cause the continuous form to be fed.

In the push tractor method, the form can be cut at about 1 inch after the end of printing.

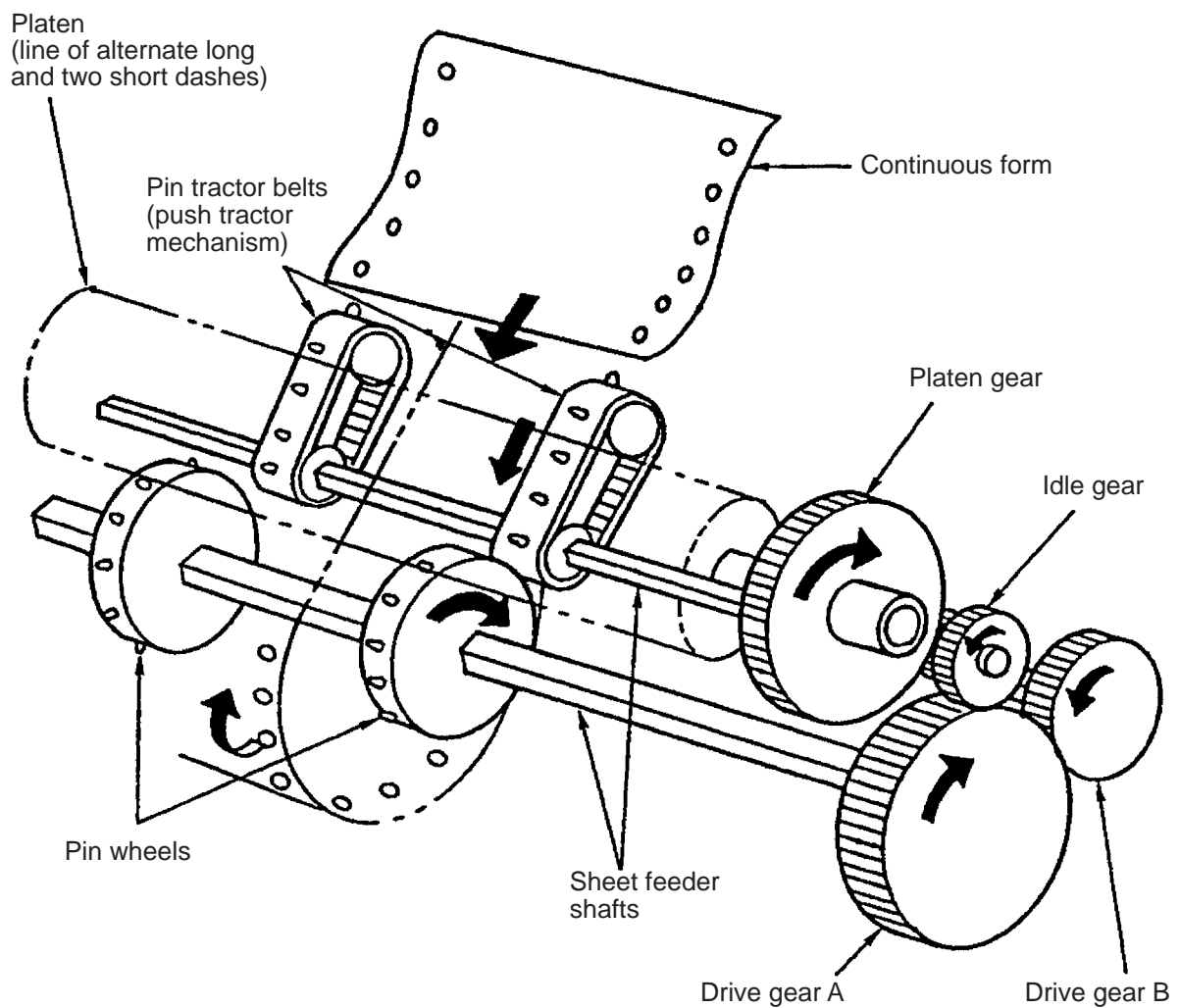


Figure 2-8 Continuous form feeding mechanism

(3) Single sheet and continuous form selection mechanism (See Figure 2-9)

Selection between the single sheet and continuous form is made by using the paper release lever on the right side of the printer mechanism.

Push the paper release lever backward. The idle gear is raised toward the front and the driving force transmission from the platen gear to drive gears A and B is disconnected, so the pin tractors interlocked with drive gear B are stopped.

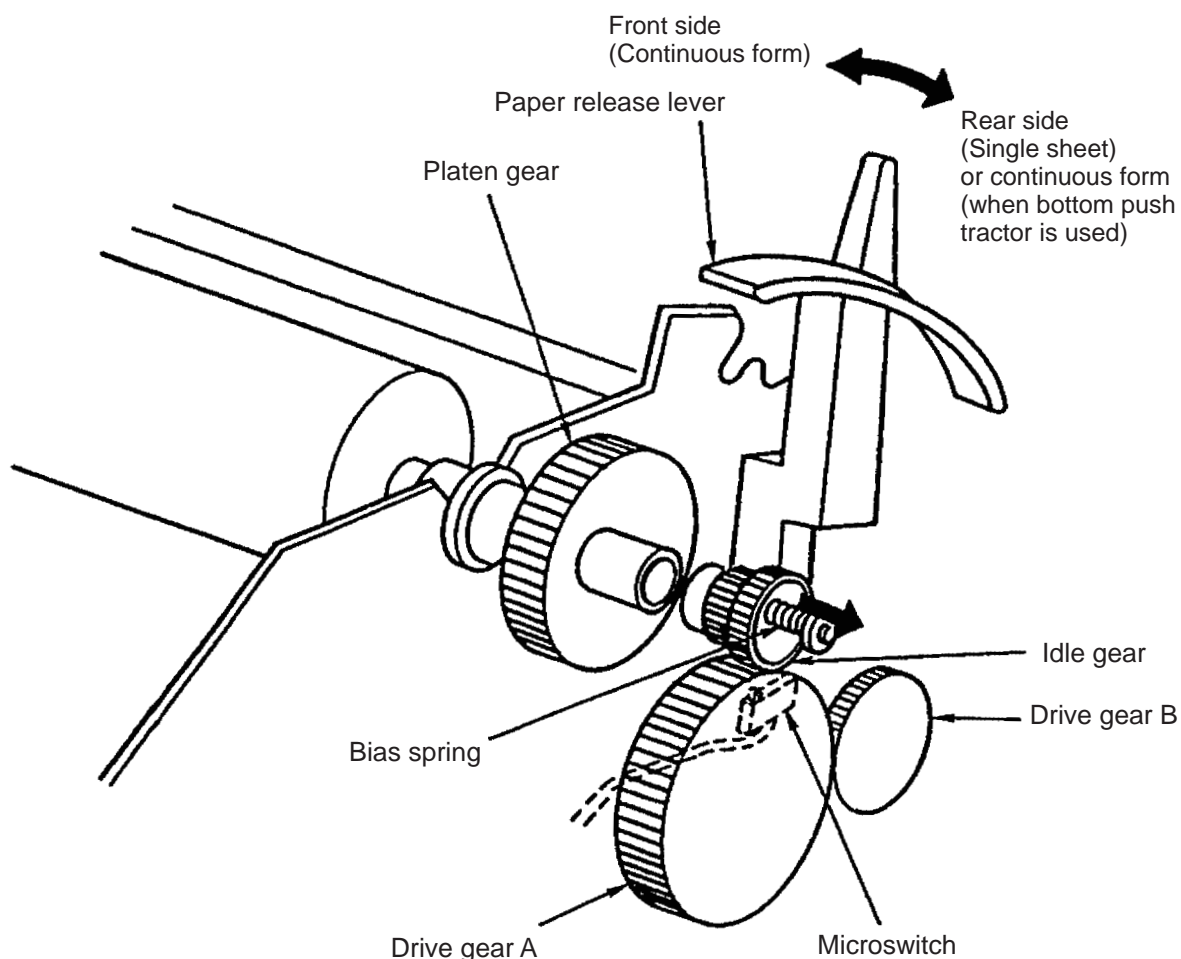


Figure 2-9 Single sheet and continuous form selection

As a result, the single sheet is fed by platen rotation but the continuous forms on the pin tractors are not fed.

When the paper release lever is pulled forward, the idle gear is forced to the bias spring and moves in the reverse direction of the arrow. Therefore, platen gear rotation is transmitted to drive gears A and B to cause feeding of the continuous form.

A microswitch is installed under the paper release lever to detect the paper release lever set position. It is used for the control of paper feeding in automatic loading.

(4) Bottom push tractor mechanism (Option) (See Figure 2-10)

The bottom push tractor is driven by the LF motor (pulse motor) in the bottom push tractor. Motor power is relayed to the drive shaft via the mini-pitch belt and this shaft feeds the paper to the printer unit.

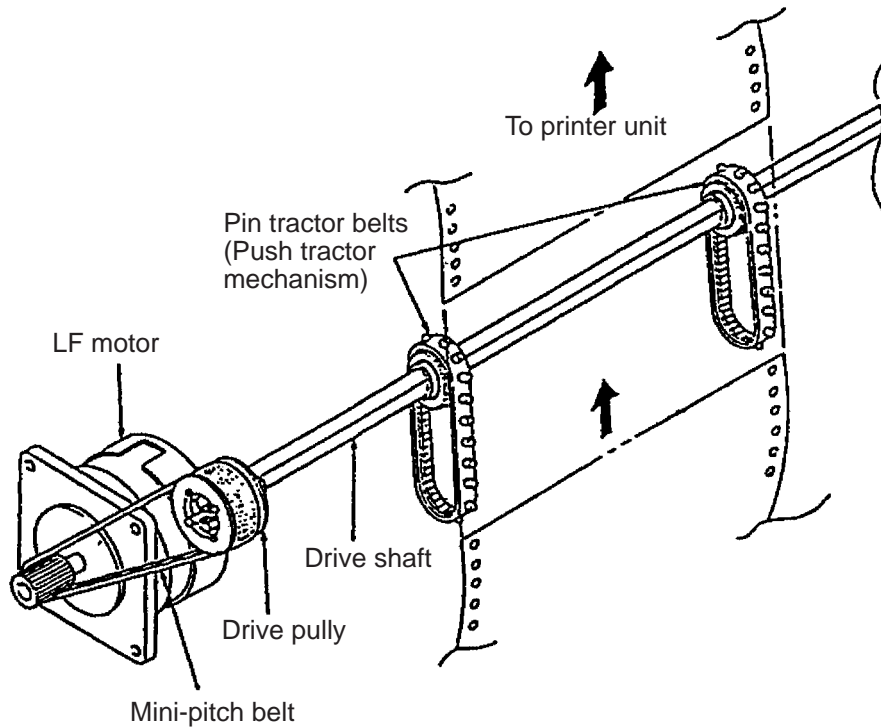
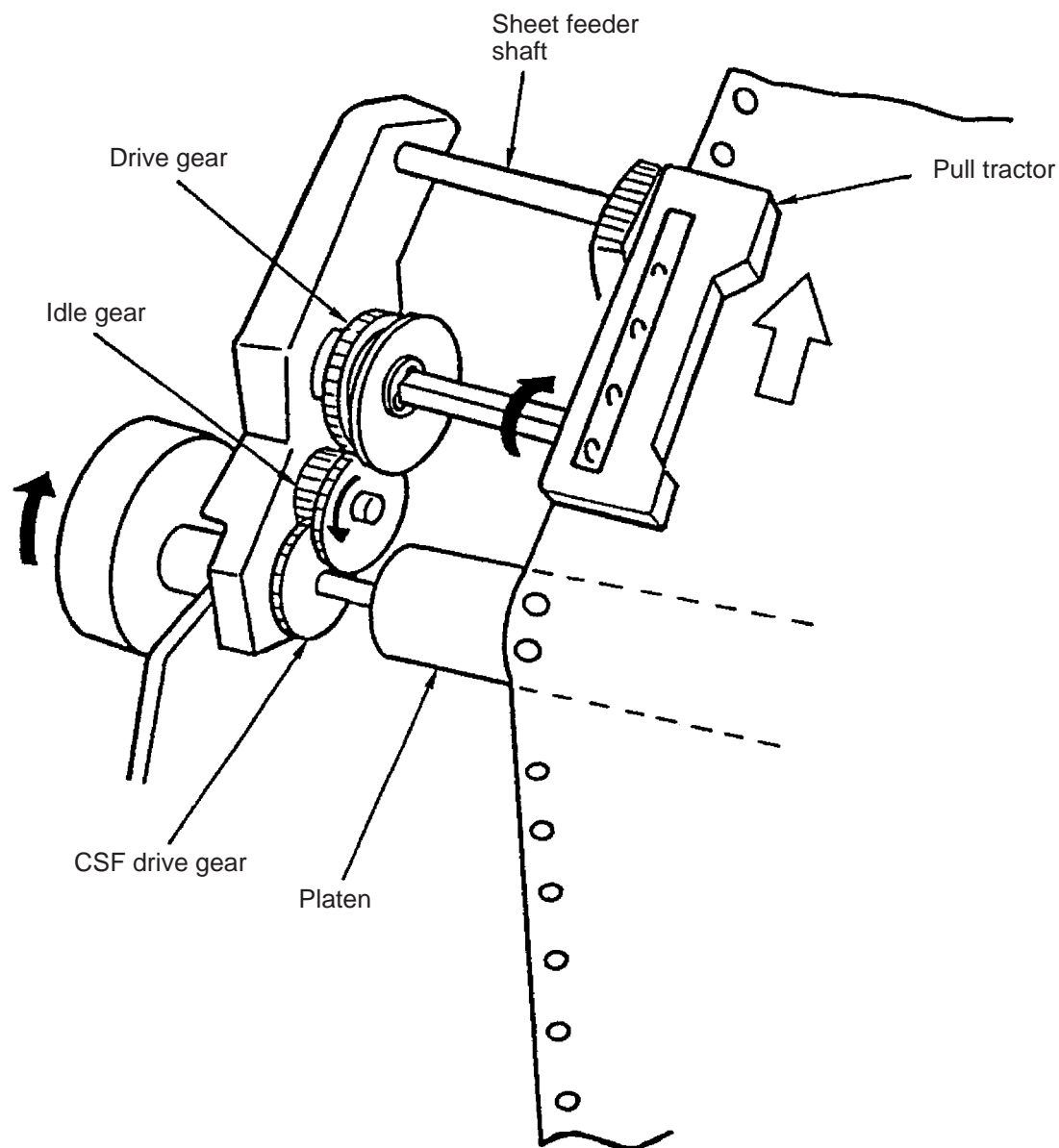


Figure 2-10 Bottom push tractor mechanism

(5) Pull tractor mechanism (Option) (See Figure 2-11)

When the optional pull tractor unit is installed, continuous from feeding in the bottom paper path is possible.



The rotation of the platen is transmitted to the idle gear of the pull tractor unit via the CSF drive gear at the left end of the platen. The idle rotation is then transmitted to the pull tractor unit drive gear to rotate the pull tractor via the sheet feeder shaft to feed the continuous form.

Figure 2-11 Pull tractor mechanism

(6) Push-pull tractor mechanism (Option) (See Figure 2-12)

This mechanism consists of the optional pull tractor and the standard push tractor.

This mechanism is used for forward and reverse feeding of the continuous form by setting it to the push and pull tractor mechanisms.

The platen pulley rotation is transmitted to the push tractor mechanism and pull tractor unit to cause form feeding at these two places. Actually the operations described in (3) and (4) above are carried out concurrently. Adjustment to eliminate slackness on the push and pull tractor mechanisms is necessary before starting continuous form feeding.

When the drive gear is pushed leftward (in the direction of the black arrow \leftarrow), the drive gear and idle gear are disengaged to rotate only the pin tractor in the pull tractor. This makes it possible to eliminate the slackness of the form.

After adjustment is completed, the spring force pushes the drive gear to the right in the direction of the white arrow \Rightarrow) to reengage it with the idle gear, thus enabling form feeding.

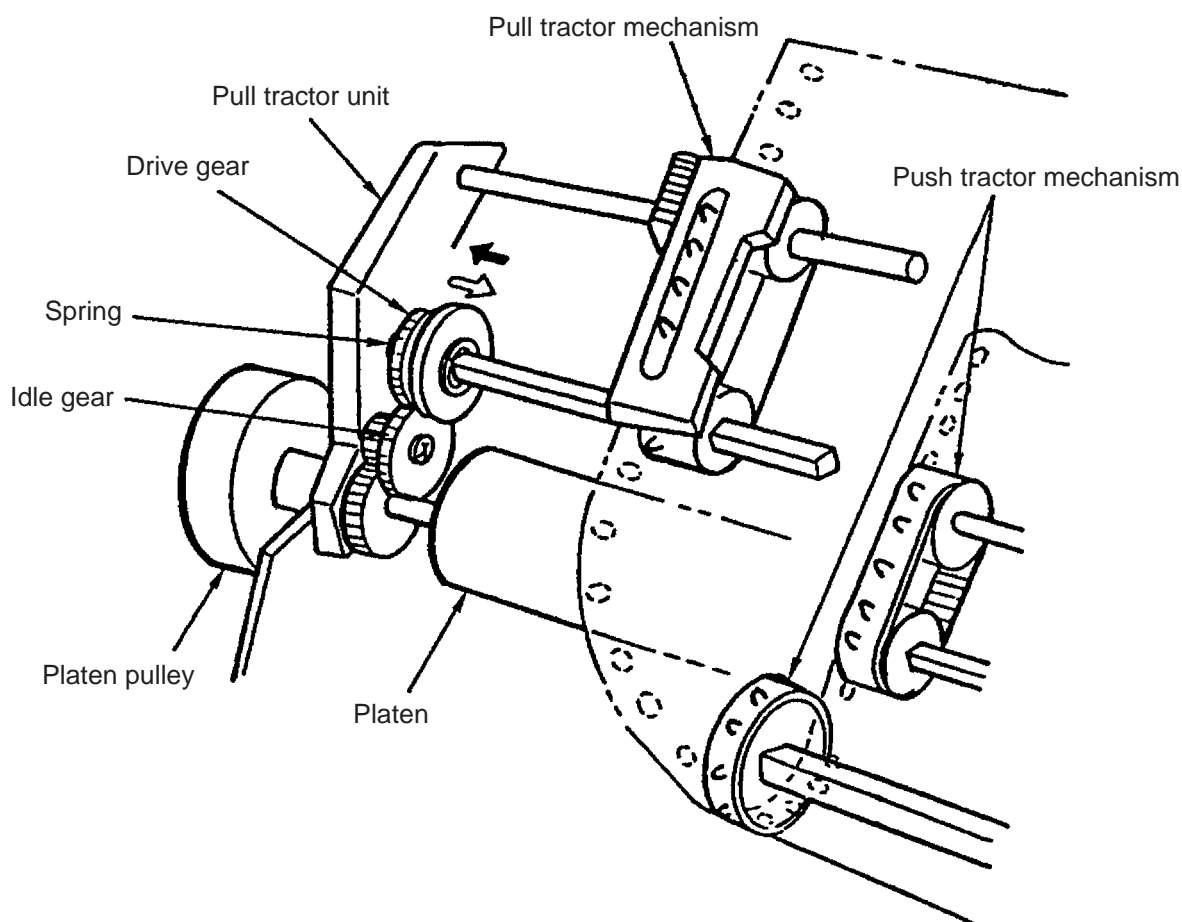


Figure 2-12 Push-puss tractor mechanism

2.3.6 Paper End Detection Mechanism (See Figure 2-13)

(1) Rear form end detection mechanism (when the form with sprocket holes is used)

The form prevents the paper end lever tip from coming into the hole on the sheet feeder cover rib and the microswitch is set to the ON state. When the form runs out, the paper end lever comes into the hole on the sheet feeder cover rib and the bottom of the paper end lever leaves the microswitch to turn it off for form end detection. The form end state is detected when the remaining form length from the printing position is down to 5.78 inches (147 mm).

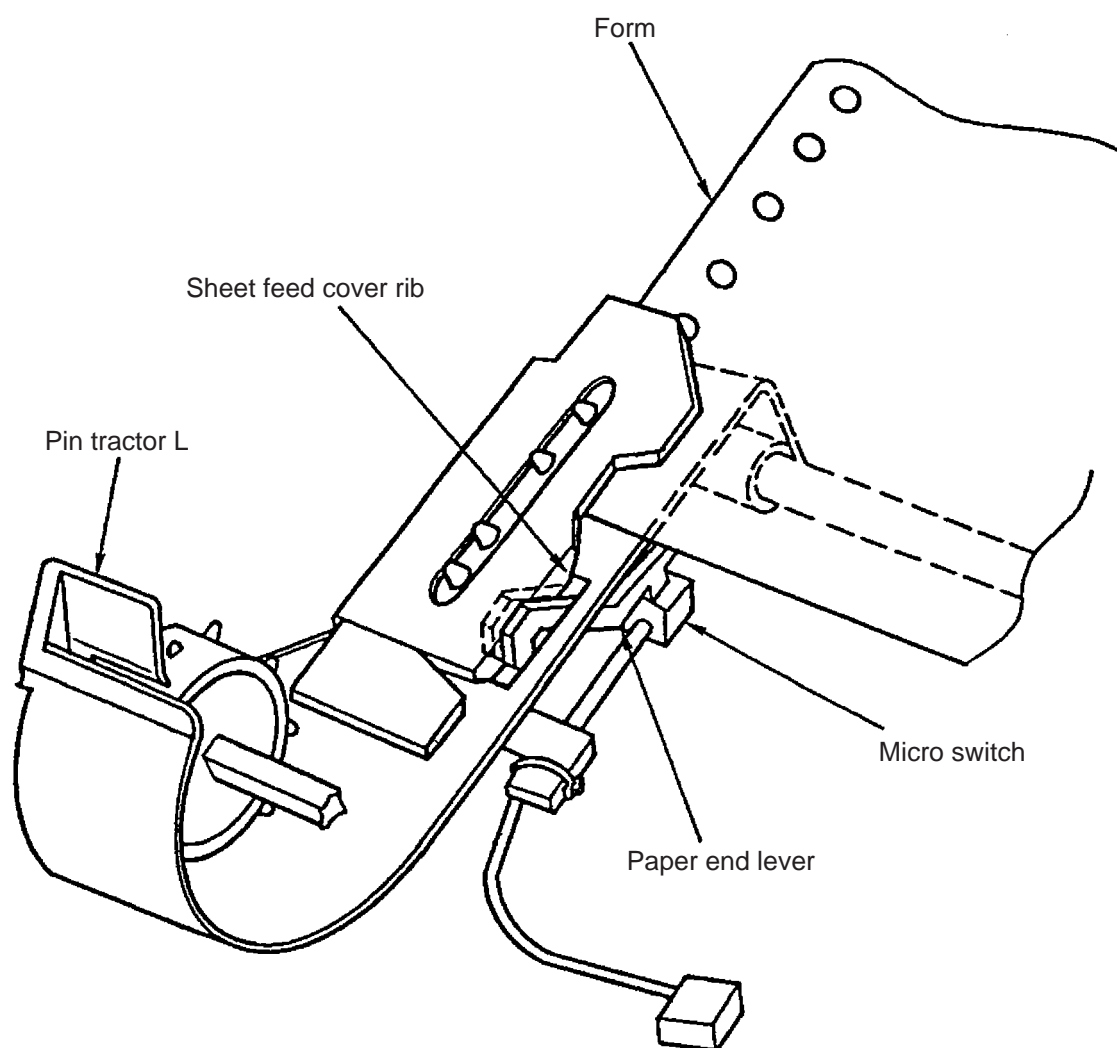


Figure 2-13 Rear form end detection mechanism

- (2) Bottom paper end detection mechanism (See Figure 2-14)
(When optional pull tractor unit is used)

When the paper exists, the paper prevents the tip end of the bottom paper end lever from coming into the hole on the main frame and the sensor is in the ON state. When the paper runs out, the bottom paper end lever comes into the hole on the main frame. At the same time, the other end of the bottom paper end lever shields the sensor to provide the OFF state for bottom paper end detection. The bottom paper end is detected when the remaining paper length from the current printing position becomes approx. 2.36 inches (60 mm).

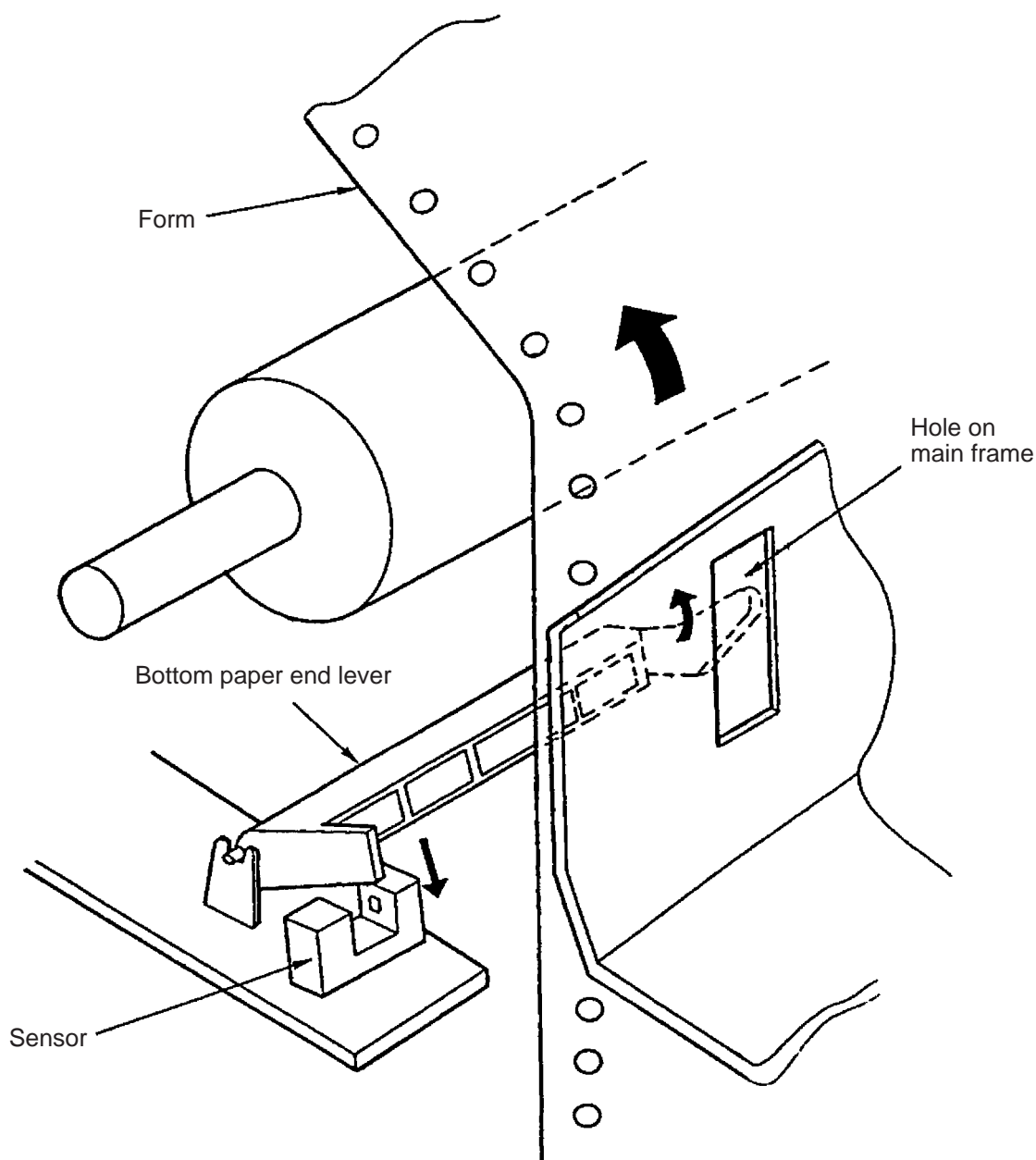


Figure 2-14 Bottom paper end detection mechanism

2.3.7 Paper Bail Open Mechanism (See Figure 2-15)

This mechanism is interlocked with the SIG function described in section 2.2.2.10.

The paper bail may be opened and closed manually, but this printer also has an automatic bail open/close mechanism. When the SIG function operates, continuous forms or single sheets are loaded automatically, and the bail is opened and closed automatically.

The paper bail is normally pulled to the platen by the spring force.

The drive system consisting of the bail motor, idle gear and bail cam are provided on the left side of the printer mechanism.

When the bail open command is sent from the switch on the operation panel or from the control unit, the bail motor starts and the bail gear is rotated via the idle gear. The bail gear has the bail open cam. As the bail gear rotates, the bail arm moves away from the platen against the spring tension.

When the bail close command is sent from the control unit, the bail motor restarts to rotate further in the same direction and the bail arm is closed.

The sensor is located on the sensor board under the bail arm to detect whether the bail arm is in the opened position or closed position.

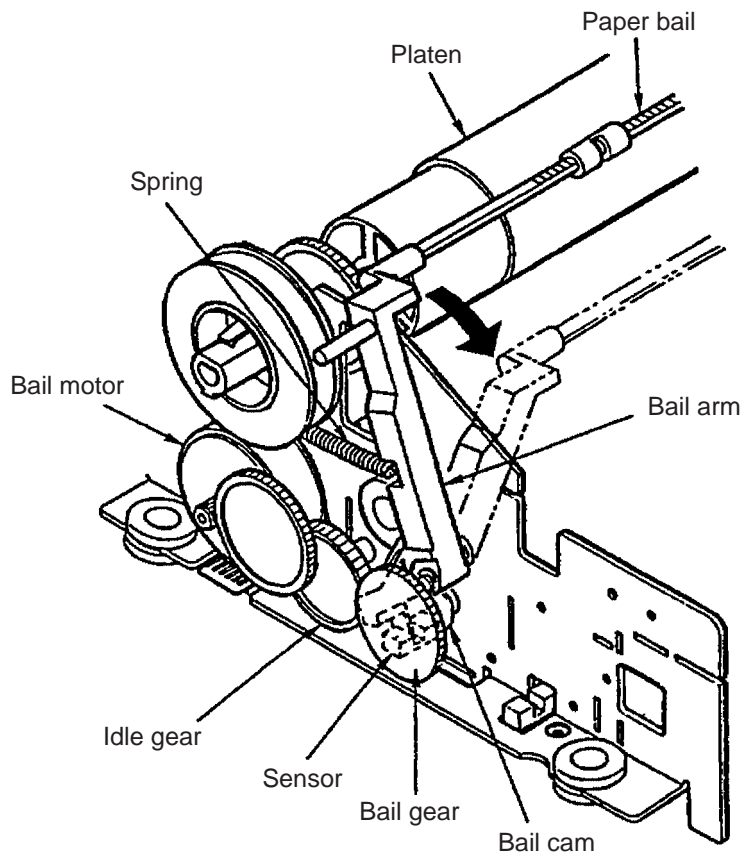
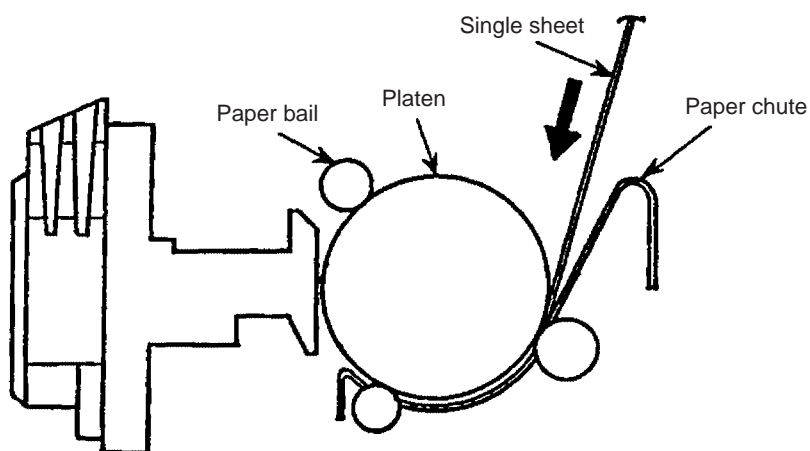


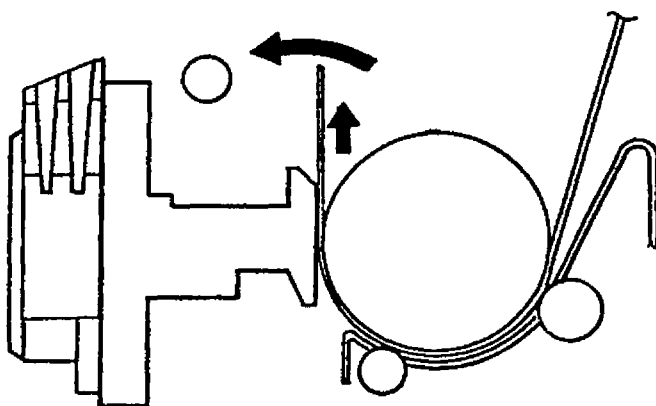
Figure 2-15 Paper bail open mechanism

The sequence of automatic paper loading by the paper bail open mechanism is explained for the single sheet.

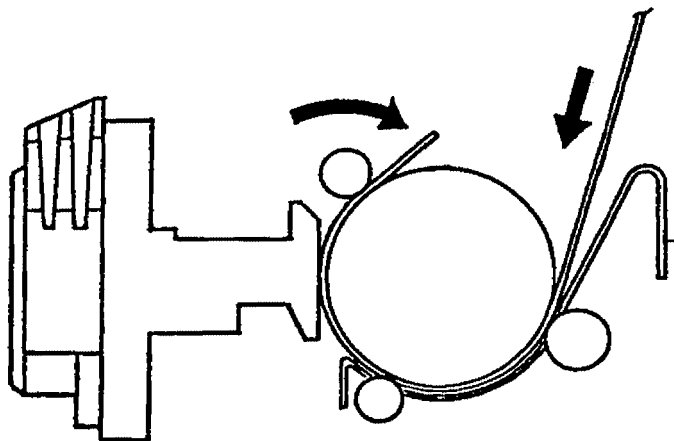
- (1) Set the paper lock release lever to the close position and set the single sheet in the paper chute.



- (2) When the FF switch on the operation board is pressed, the paper bail is automatically set to the open position. Here, the sheet is fed for a fixed length.



- (3) The paper bail is automatically closed.



2.3.8 Color Ribbon Change Mechanism (See Figure 2-16)

This mechanism selects the ribbon color. It works as the rotation of the bail motor vertically shifts the ribbon guide installed on the carriage as well as ribbon cartridge installed on the printer frame.

At the ribbon change command, the bail motor starts rotating which is transmitted to the ribbon shift gear via the idle gear and the bail gear, and then to the ribbon shift cam via the coaxial one-way clutch.

A single rotation of the ribbon shift cam gives two stages of shift. Each color is stopped at when the ribbon cartridge and the ribbon guide is climbing up.

The ribbon shift cam rotation gives the ribbon cartridge bracket vertical transposition location of which is transmitted to the shift arm by the roller lever for control of the ribbon guide.

A sensor detecting the ribbon cartridge and the ribbon guide location is placed on the lower sensor board of the ribbon shift cam.

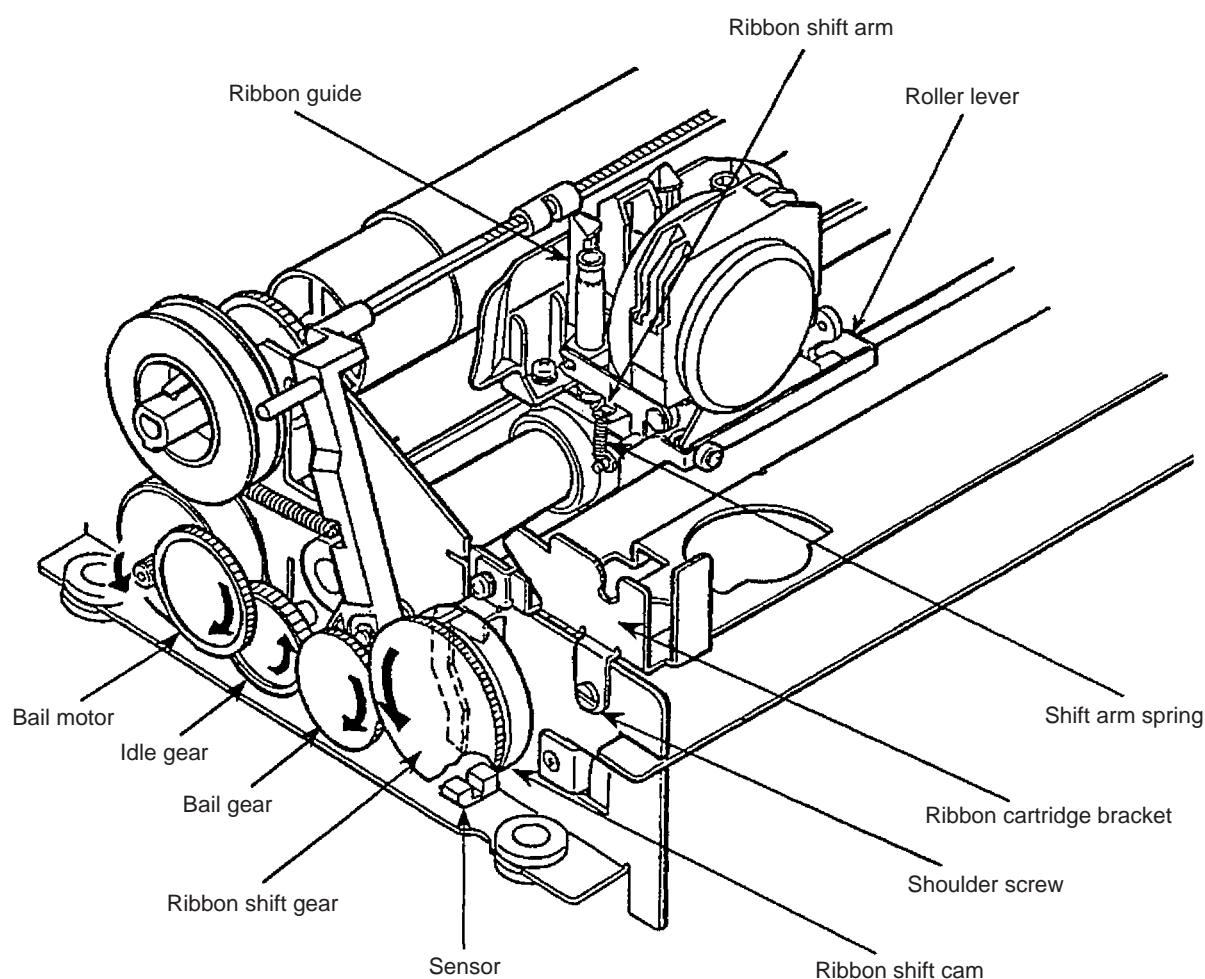


Figure 2-16 Color ribbon change mechanism

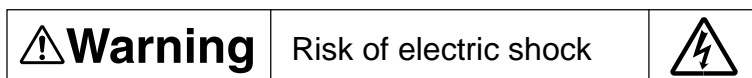
3. ASSEMBLY/DISASSEMBLY SECTION

This section explains the procedures for removing and installing various assemblies and units in the field.

Description is mainly limited to the removal procedure; installation should basically be performed in the reverse sequence of the removal procedure.

3.1 Cautions on Assembly/Disassembly

- (1) Remove the AC cable and the interface cable before disassembling or assembling
 - (a) Turn off the AC power switch. Remove the AC input plug of the AC cable from the receptacle. Remove the AC cable from the inlet on the printer.

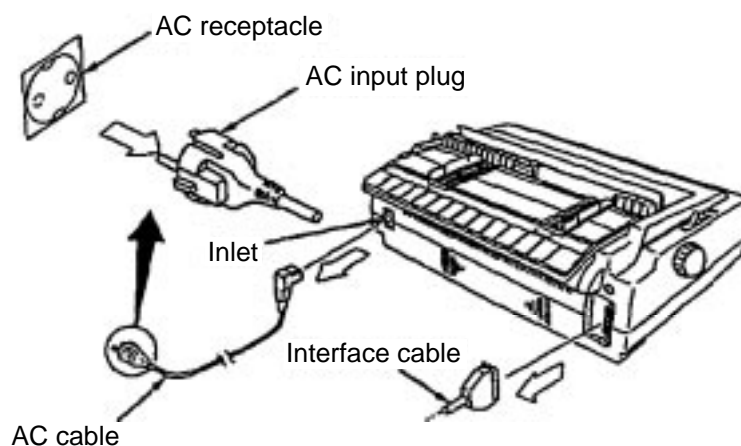


There is a risk of electric shock during replacement of the power supply.

Use insulating gloves or avoid direct contact with any conducting part of the power supply, and caution should be exercised during replacement.

The capacitor may take one minute to complete discharge after the AC cable is unplugged. Also, there is a possibility that the capacitor doesn't discharge because of a breakage of the PCB, etc., so remember the possibility of electric shock to avoid electric shock.

- (b) To connect the AC cable again, connect it to the inlet on the printer first, then insert the AC input plug into a receptacle.







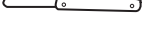
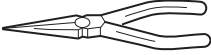





- (2) Do not disassemble the printer as long as it is operating normally.
- (3) Do not remove unnecessary parts, and limit the disassembly area as small as possible.
- (4) Use the designated service tools.
- (5) Carry out disassembly in the prescribed sequence; otherwise, damage to the parts may result.
- (6) It is advisable to temporarily install screws, snap rings and other small parts in their original positions to avoid losing them.
- (7) Whenever handling the microprocessors, ROM, RAM IC chips and boards, do not use gloves which may cause static electricity.
- (8) Do not place the printed circuit board directly on the equipment or on the floor.
- (9) If adjustment is specified in the middle of installation. follow the instructions.

3.2 SERVICE TOOLS

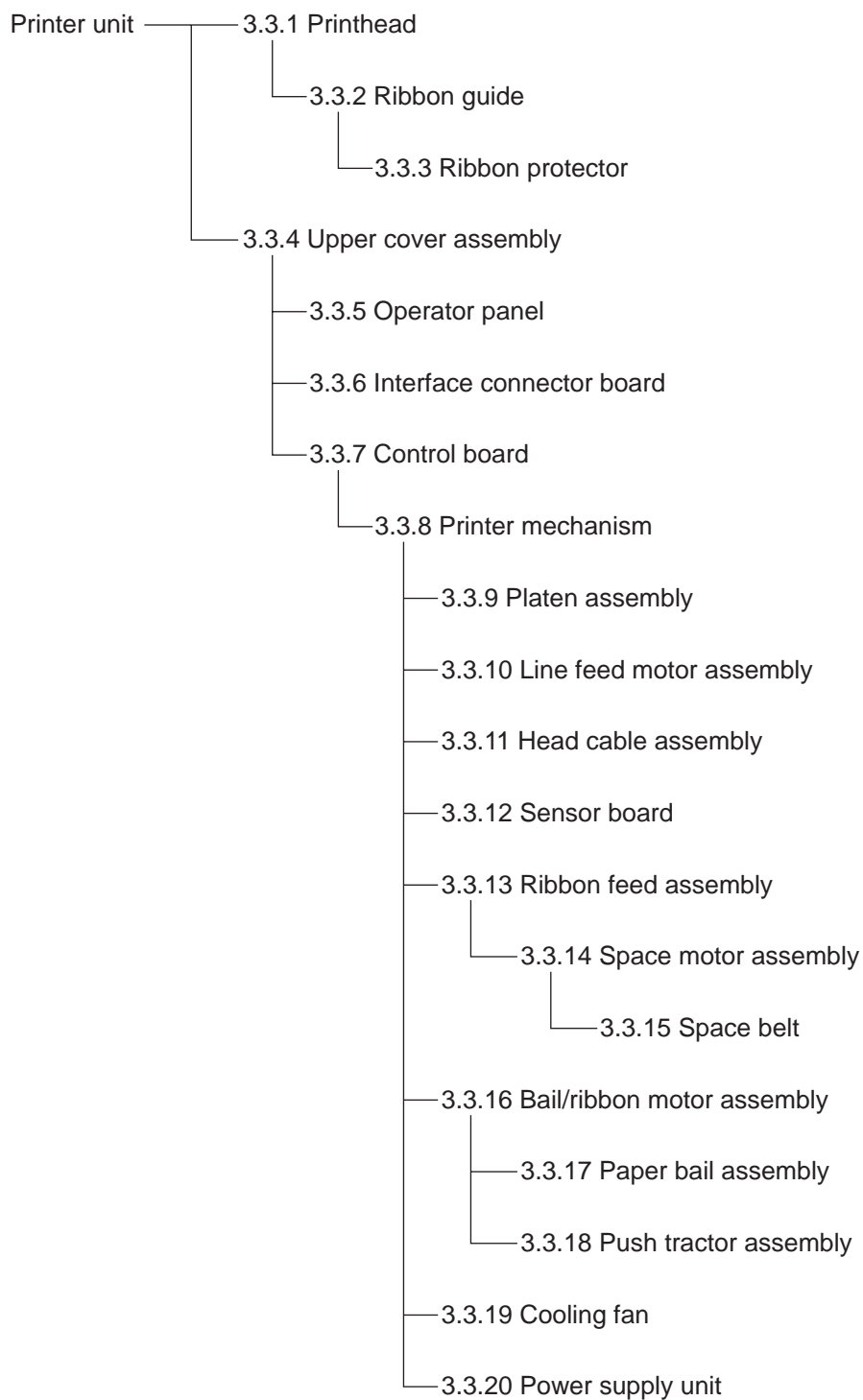
Table 3-1 lists the tools necessary for replacing printed circuit boards and parts of units in the field.

Table 3-1 Service tools

No.	Service tool		Q ty	Use	Remarks
1		No.1-100 Phillips screwdriver	1	Screws 2.6mm	
2		No.2-200 Phillips screwdriver	1	Screws 3-5mm	
3		No.3-100 screwdriver	1		
4		Spring hook	1		
5		7mm wrench	1		
6		Volt/ohmmeter	1		
7		Thickness gauge	1	Head gap adjustment	
8		Pliers	1		
9		No.5 nippers	1		
10		1.1 lbs (500 g) bar pressure gauge	1		
11		Mylar gauge	1	0.05mm x 10 sheets and 0.1 mm x 1 sheet	4PP4043 -3113G3

3.3 Assembly/Disassembly Procedures

This section explains the assembly replacement procedures according to the following disassembly system.



3.3.1 Printhead

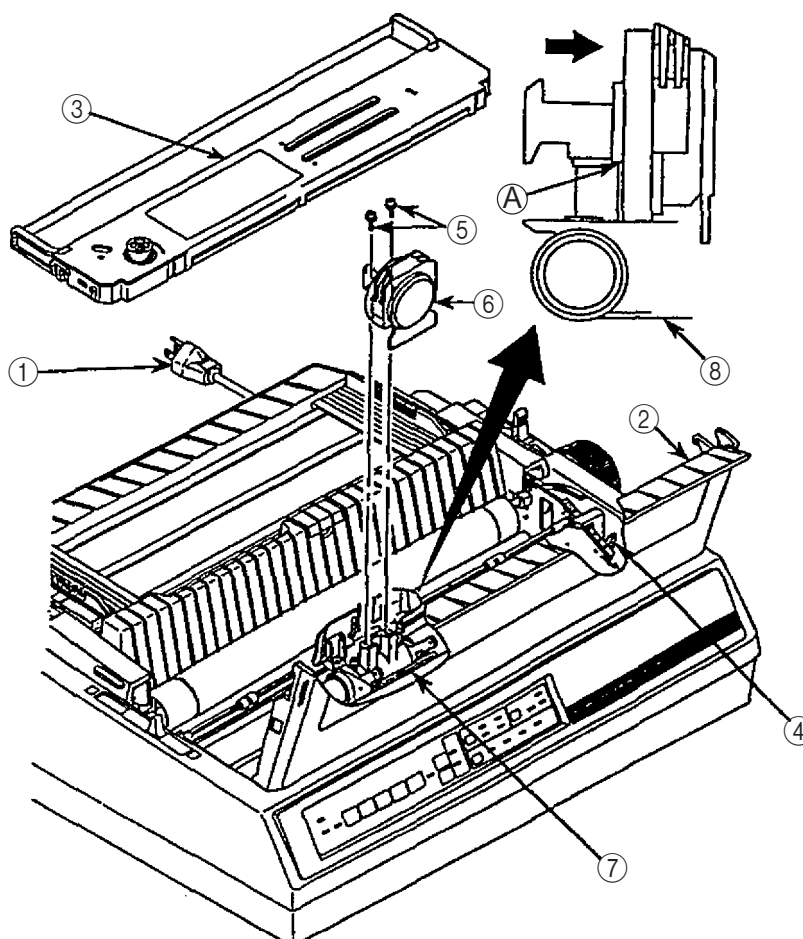
[Caution]

The printhead may be hot immediately after printing.

- (1) Turn OFF the AC POWER switch, and remove AC cord ① from the receptacle.
- (2) Open access cover ②.
- (3) Remove ribbon cartridge ③.
- (4) Pull down head gap adjusting lever ④ to the front range (range 9 position).
- (5) Remove two screws ⑤, and disconnect printhead ⑥ from connector ⑦ by lifting up vertically.
- (6) To install, reverse the removal procedures sequence.

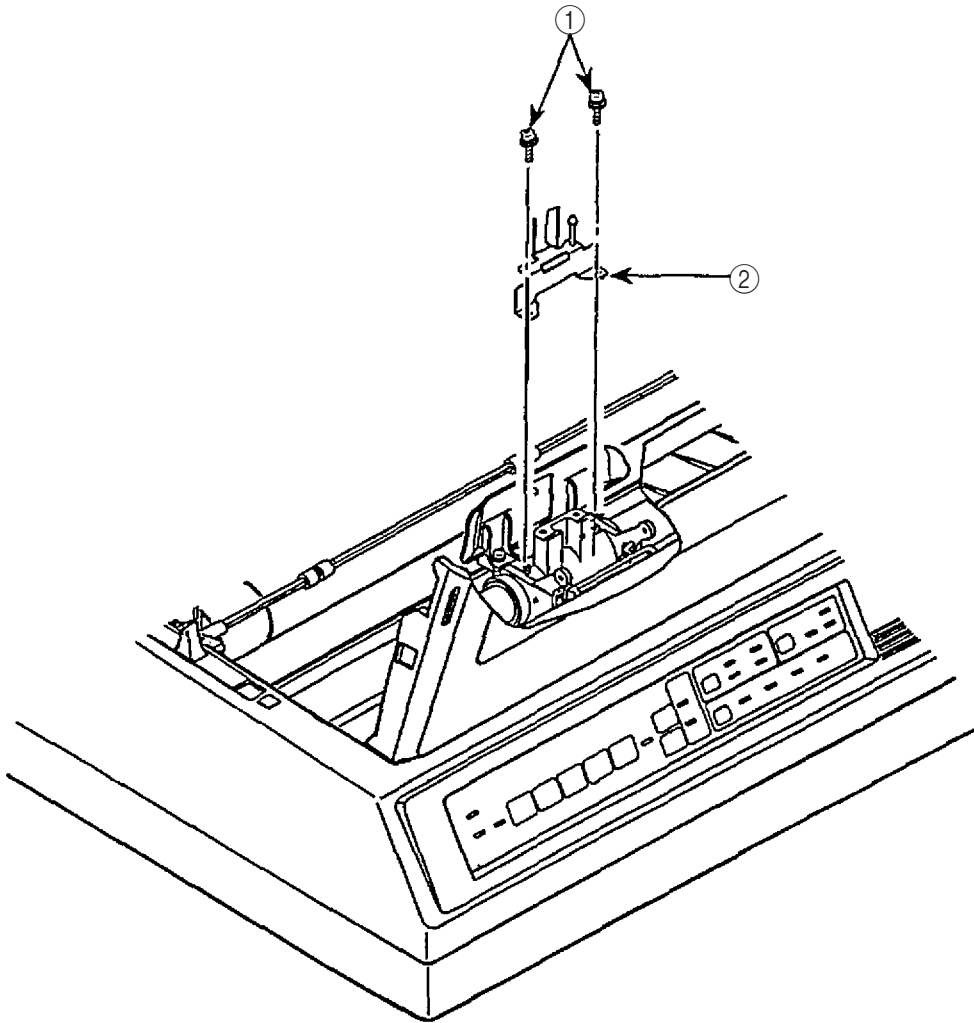
[Note on installation]

- (1) Install printhead ⑥ while pressing it in the direction of the arrow so that it will contact tightly surface ○ of carriage frame ⑧.



3.3.2 Ribbon Guide

- (1) Remove the printhead. (See section 3.3.1).
- (2) Remove two screws ①, then remove ribbon guide ②.
- (3) To install, reverse the removal procedure sequence.

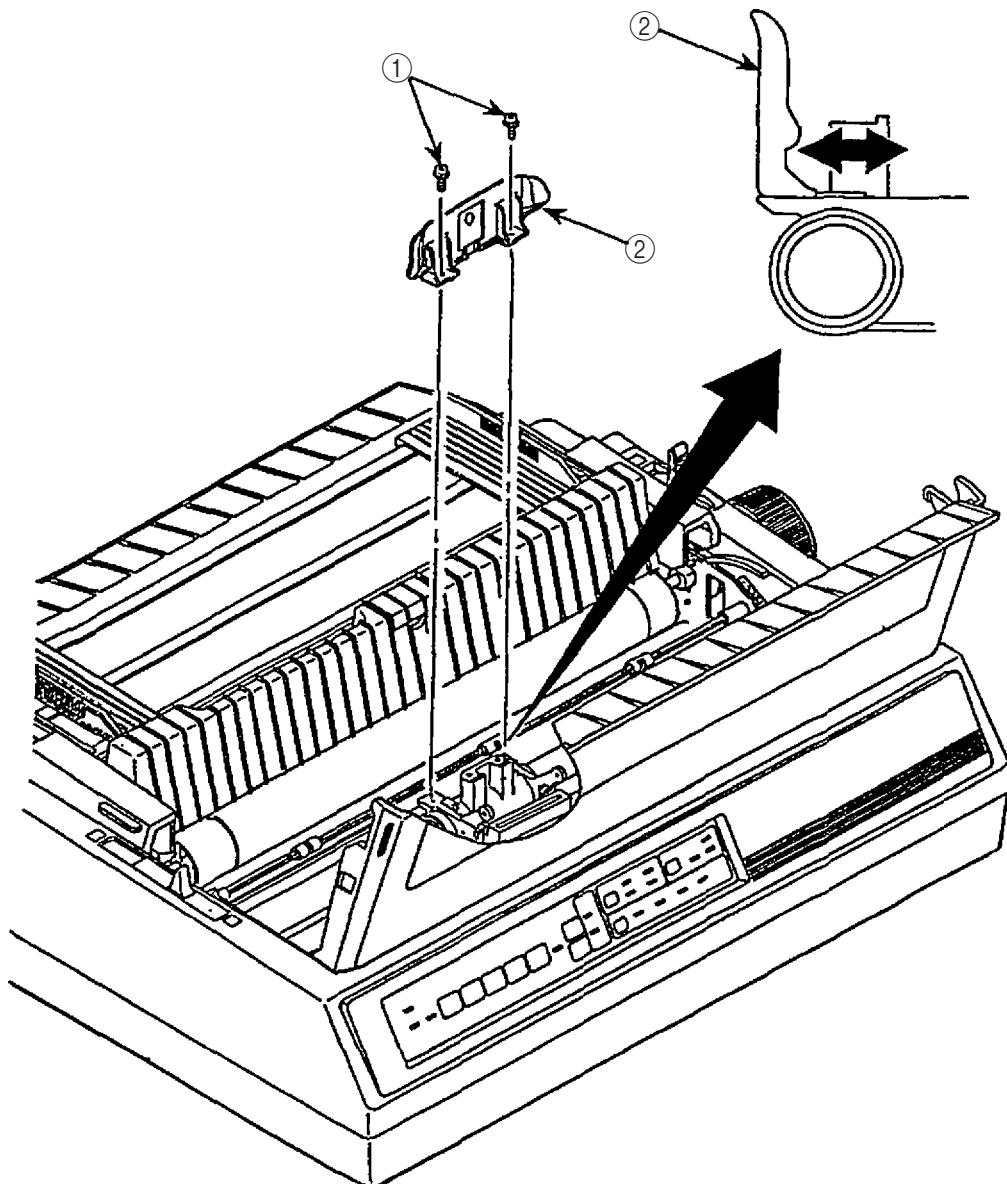


3.3.3 Ribbon Protector

- (1) Remove the ribbon guide. (See section 3.3.2.)
- (2) Remove two screws ①, then remove ribbon protector ② by lifting up.
- (3) To install, reverse the removal procedure sequence.

[Notes on installation]

- (1) Align the printhead center with the center of the ribbon protector hole.
- (2) Adjust the gap between the ribbon protector and the platen. (See section 4.2.)

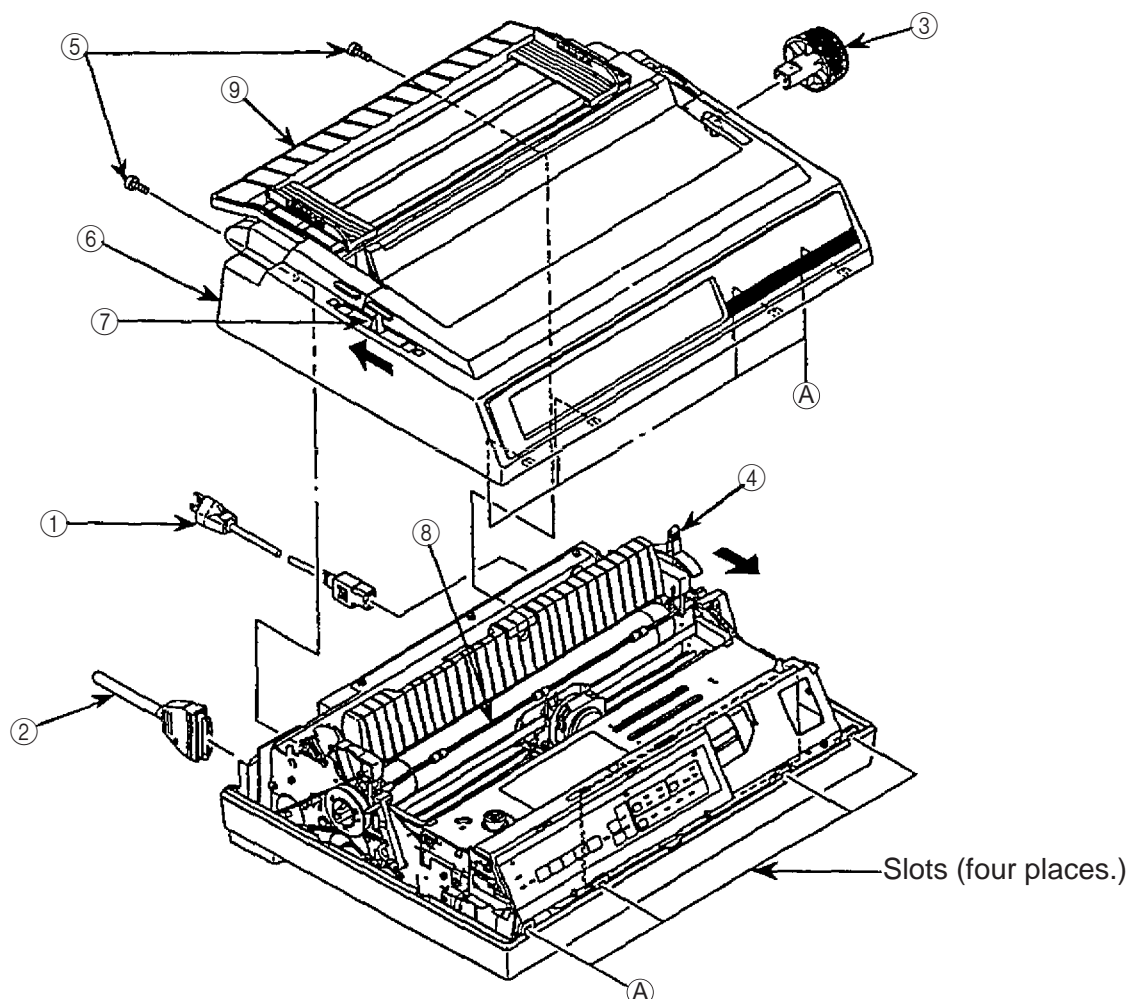


3.3.4 Upper Cover Assembly

- (1) Set the AC POWER switch to OFF and pull out the AC plug ① from the receptacle.
- (2) Disconnect interface cable ②.
- (3) Pull out platen knob ③.
- (4) Turn release lever ④ forward.
- (5) Remove two screws ⑤ in the rear of the printer. First lift Rear Cover assembly ⑨ to upright position, then lift the rear end of upper cover assembly ⑥ on the front part and slide it toward the front to take it off from the four slots. Then remove the whole upper cover assembly by lifting it vertically.
- (6) To install, reverse the removal procedure sequence.

[Note on installation]

- (1) At installation of the upper cover assembly, turn bail open lever ⑦ backward. Confirm that the paper bail ⑧ moves according to the bail open lever after installation.

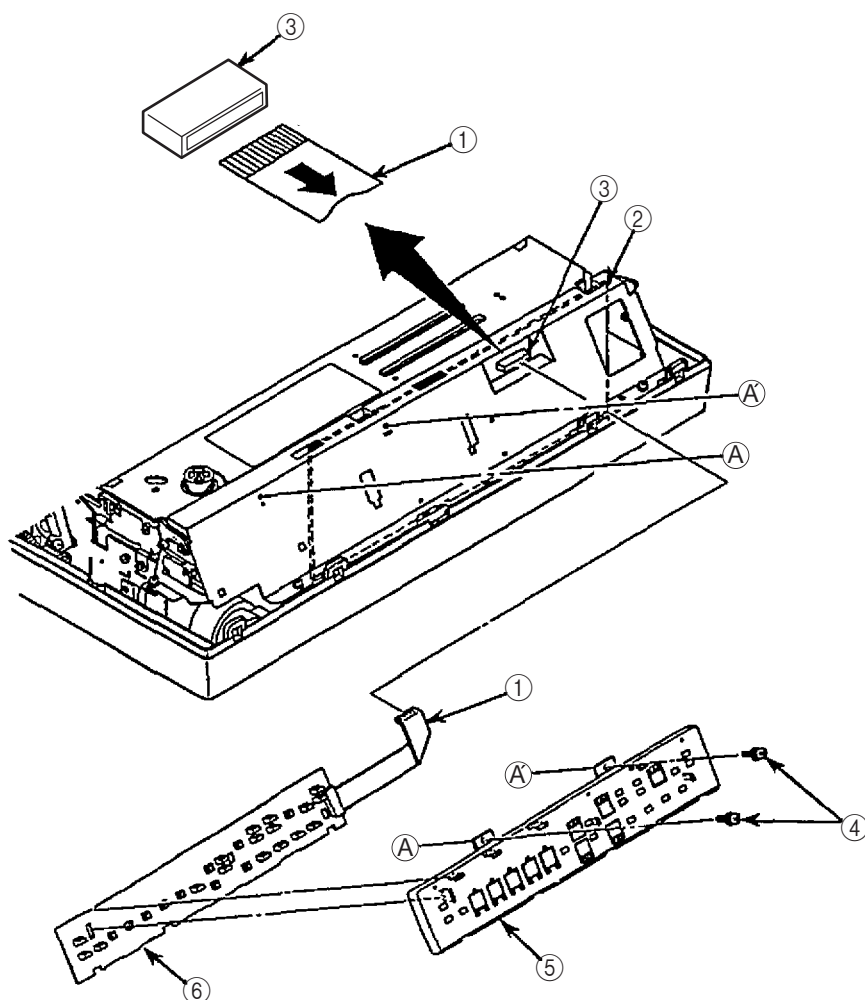


3.3.5 Operator Panel

- (1) Remove the upper cover. (See section 3.3.4)
- (2) Disconnect cable ① of operator panel ⑥ from connector CN10 ③ of control board ②.
- (3) Remove two screws ④.
- (4) Remove the operator panel holder ⑤ by moving it upward, and then pulling to the front.
- (5) Unlock seven claws of operator panel holder ⑤ which are used for fixing the operator panel ⑥.
- (6) Remove operator panel ⑥ from operator panel holder ⑤.
- (7) To install, reverse the removal procedure sequence.

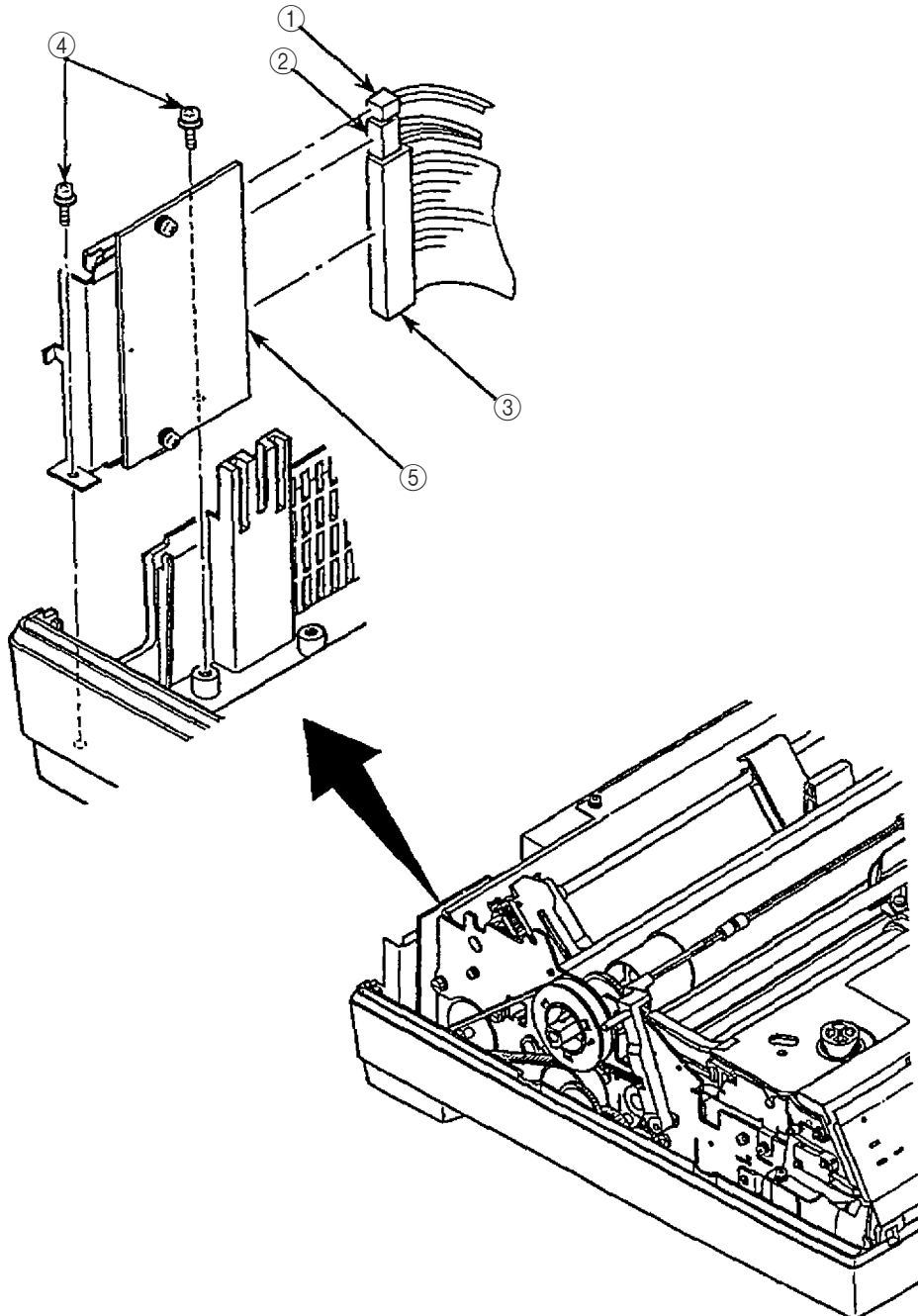
[Note on installation]

- (1) Insert the cable ① to the connector ③ in the reversed direction of arrow ○ to fix the cable ①.



3.3.6 Interface Connector Board

- (1) Remove the upper cover. (See section 3.3.4)
- (2) Disconnect cables ① and ②.
- (3) Remove two screws ④, and remove interface connector board ⑤ upward.
- (4) Disconnect cable ③.
- (5) To install, reverse the removal procedure sequence.

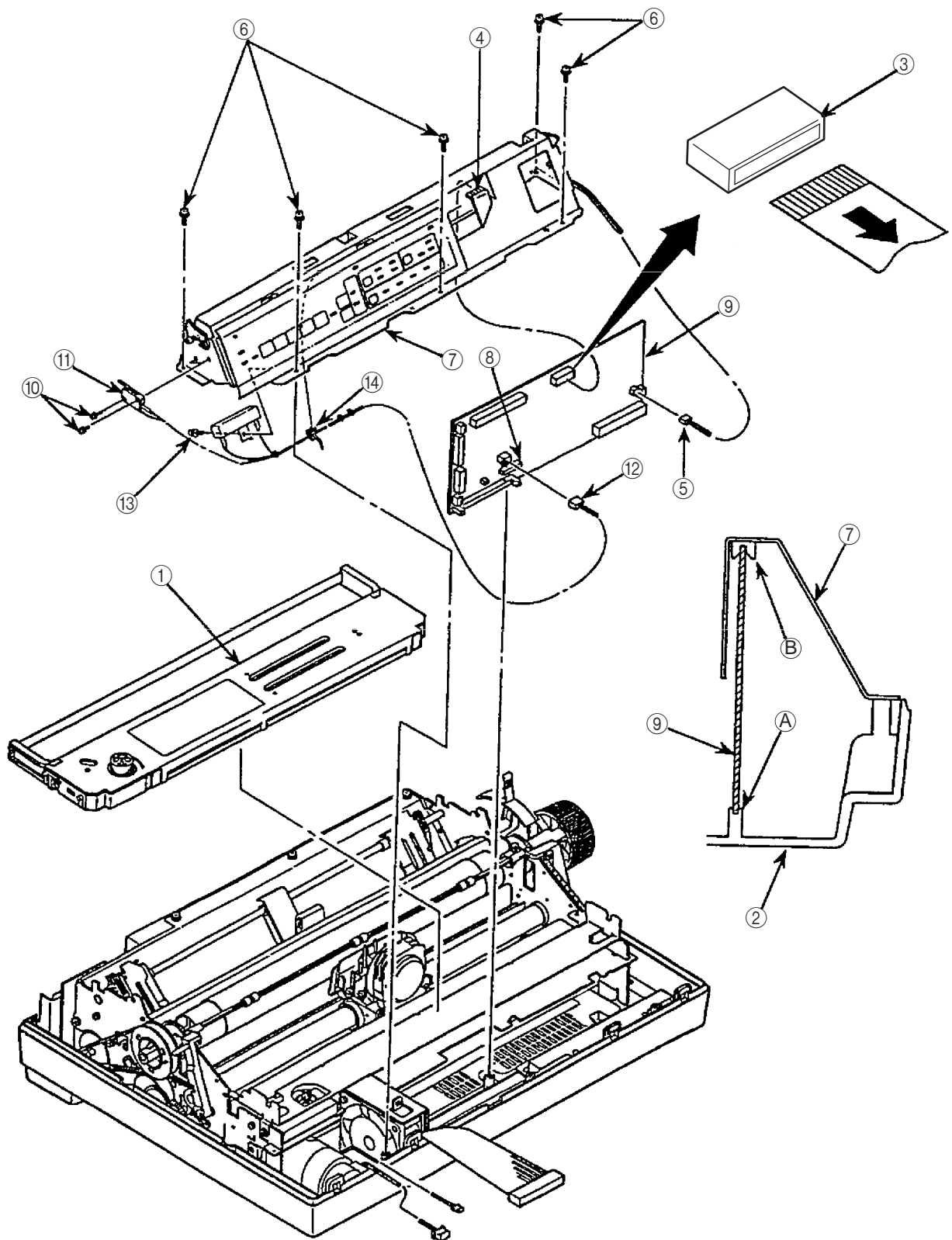


3.3.7 Control Board and Interlock Switch Assembly

- (1) Remove the upper cover. (See section 3.3.4.)
- (2) Remove ribbon cartridge ①.
- (3) Release the lock of control board connector CN10 ③, and pull out cable ④.
- (4) Remove five screws ⑥, and remove shield cover assembly ⑦.
- (5) Remove cables ⑤, and ⑫.
- (6) Loosen set screw ⑧, and remove all connectors (CN1 to CN9) from control board ⑨ while lifting it slightly.
- (7) Remove control board ⑨.
- (8) Remove two screws ⑩, and the screw ⑬.
- (9) Remove cable clamp ⑭, and remove interlock switch assembly ⑪.
- (10) To install, reverse the removal installation procedure sequence.

[Notes on installation]

- (1) Do not allow the connecting cable to be caught under control board ⑨.
- (2) Insert control board ⑨ in groove (A) on lower cover②, and butt it on the right before tightening the set screw.
- (3) Before fixing the shield cover, fit control board ⑨ in groove (B) on it.



3.3.8 Printer Mechanism

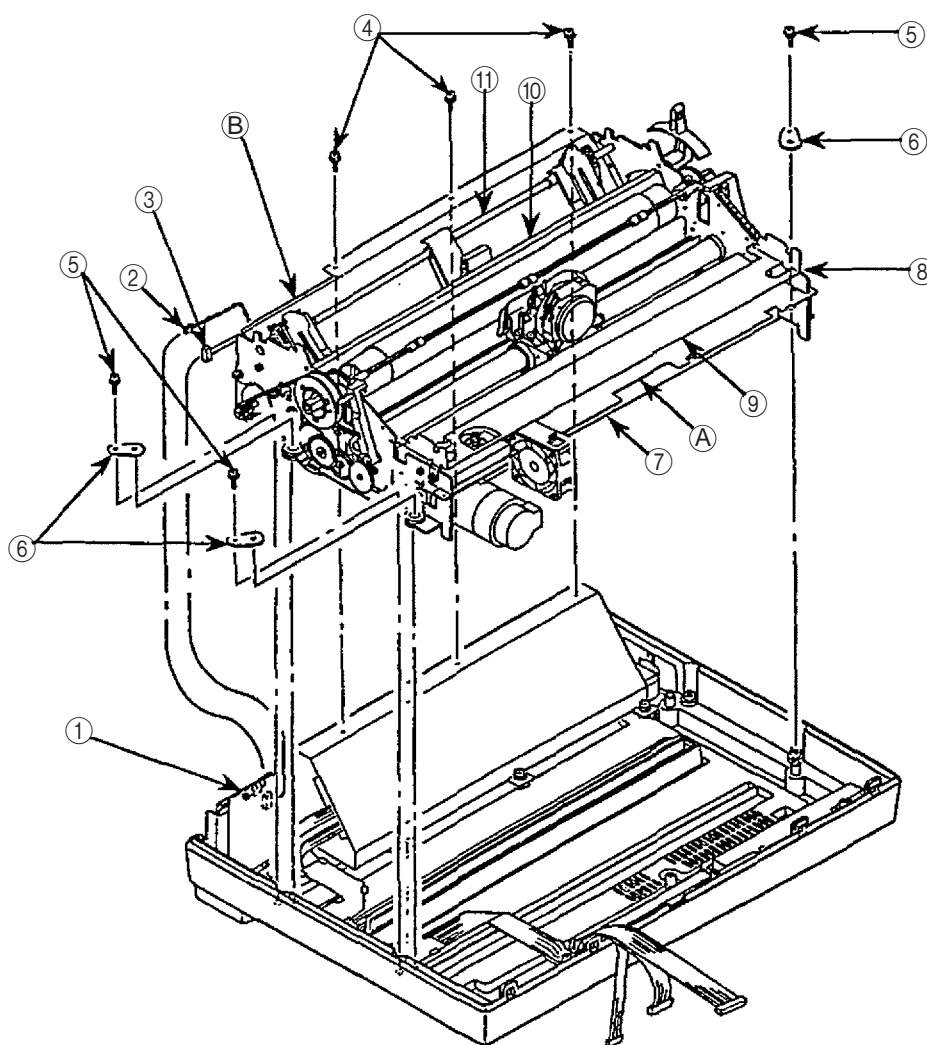
- (1) Remove the control board. (See section 3.3.7.)
- (2) Disconnect cables CN102 ② and CN103 ③ connected to interface connector board ①.
- (3) Remove three screws ④.
- (4) Remove three screws ⑤, and remove fitting ⑥ (three places).
- (5) Holding the front side (portion ○) and rear side (portion ⑧) of base frame ⑦, lift it up vertically for removing printer mechanism ⑧.

Do not hold ribbon cartridge bracket ⑨, paper chute ⑩ and guide shaft ⑪ of the sheet feeder assembly when removing printer mechanism ⑧.

- (6) To install, reverse the removal procedure sequence.

[Note on installation]

- (1) Do not allow the cables and connectors to be caught under printer mechanism.

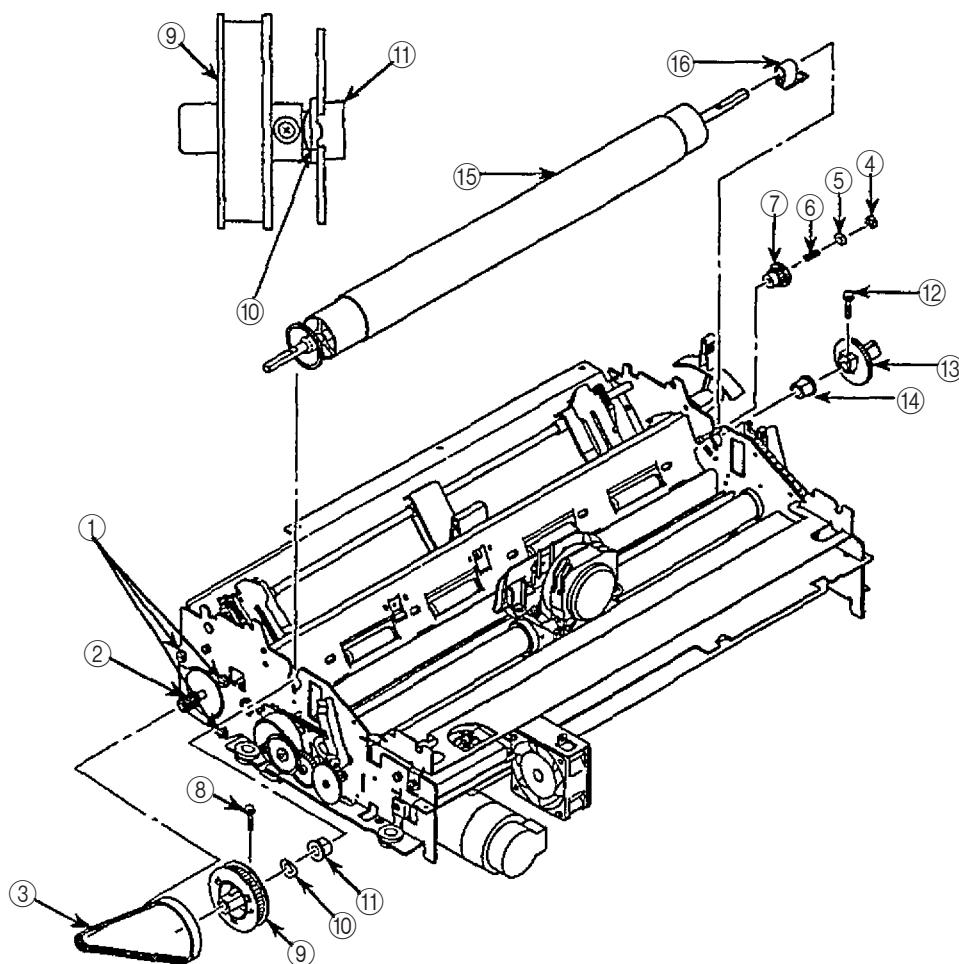


3.3.9 Platen Assembly

- (1) Remove the printer mechanism. (See section 3.3.8.)
- (2) Loosen three bolts ①, move LF motor ② close to platen ⑮, and remove line feed belt ③.
- (3) Remove "E" snap ring ④, and remove washer A ⑤, spring ⑥ and idle gear ⑦.
- (4) Remove screw ⑧, and remove gear pulley ⑨, washer B ⑩ and bearing ⑪.
- (5) Remove screw ⑫, and remove gear ⑬ and bearing ⑭.
- (6) Take out the platen assembly ⑮ and platen lever ⑯.
- (7) Remove platen lever ⑯.
- (8) To install, reverse the removal procedure sequence.

[Notes on installation]

- (1) Be sure to install correctly washer B ⑩.
- (2) Be sure to adjust the belt tension after installing line feed belt ③. (See section 4.5.)

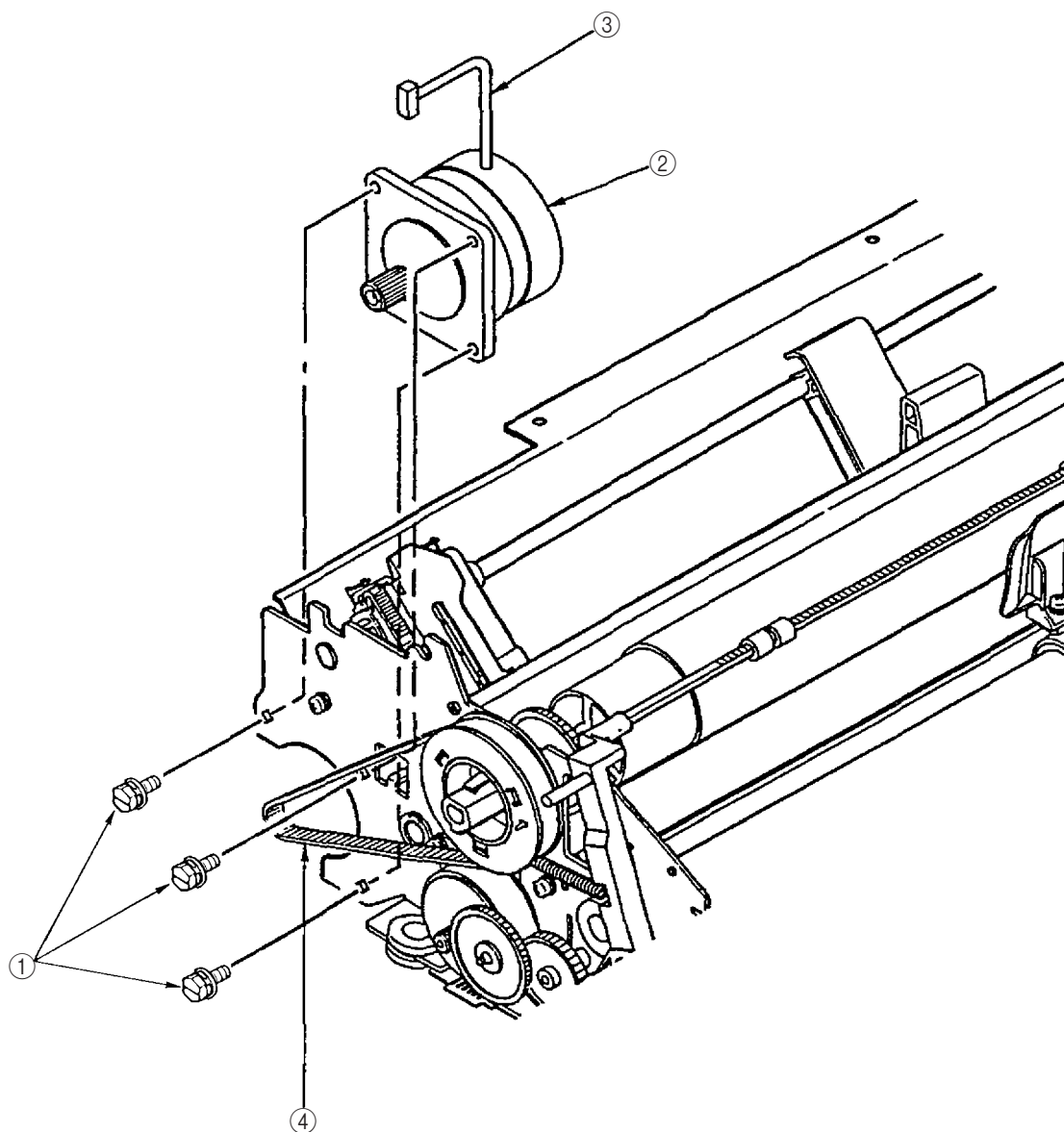


3.3.10 Line Feed Motor Assembly

- (1) Remove the printer mechanism. (See section 3.3.8.)
- (2) Remove three bolts ①, then remove line feed motor ②.
- (3) To install, reverse the removal procedure sequence.

[Notes on installation]

- (1) Pay attention to the orientation of cable ③ extending out of line feed motor ②.
- (2) Adjust line feed belt ④ tension after installing line feed motor ②. (See section 4.5.)

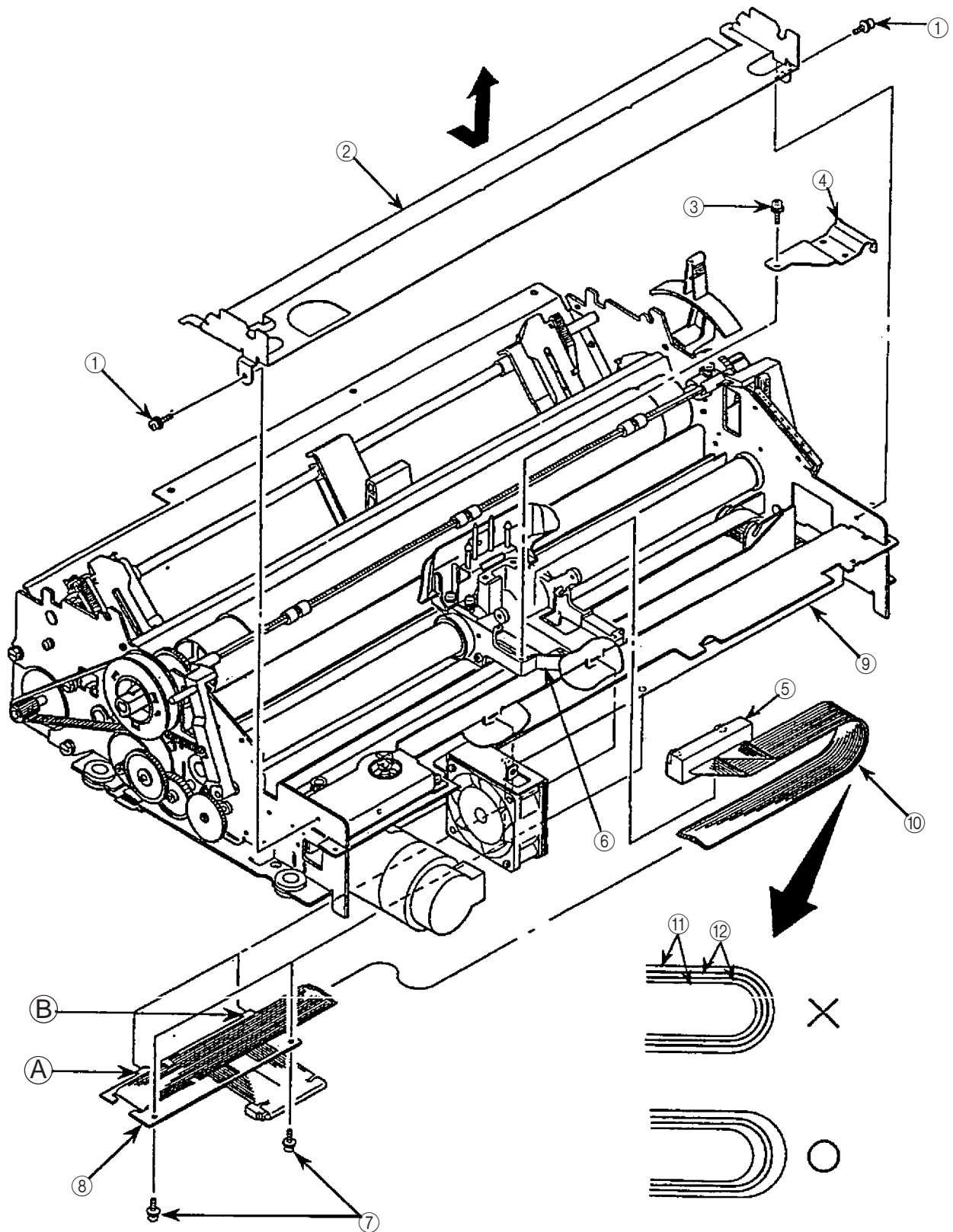


3.3.11 Head Cable Assembly

- (1) Remove the printhead. (See section 3.3.1.)
- (2) Remove the printer mechanism. (See section 3.3.8.)
- (3) Remove two screws ①, and remove cartridge bracket ②.
- (4) Remove screw ③, and remove connector clamp ④.
- (5) Remove head cable connector ⑤ from carriage frame ⑥.
- (6) Remove two screws ⑦, and remove the hooks (○, ㊦) of the cable clamp ⑧ off base frame ⑨.
- (7) Remove head cable assembly ⑩ by pulling downward while slightly lifting up the front end of the printer mechanism.
- (8) To install, reverse the removal procedure sequence.

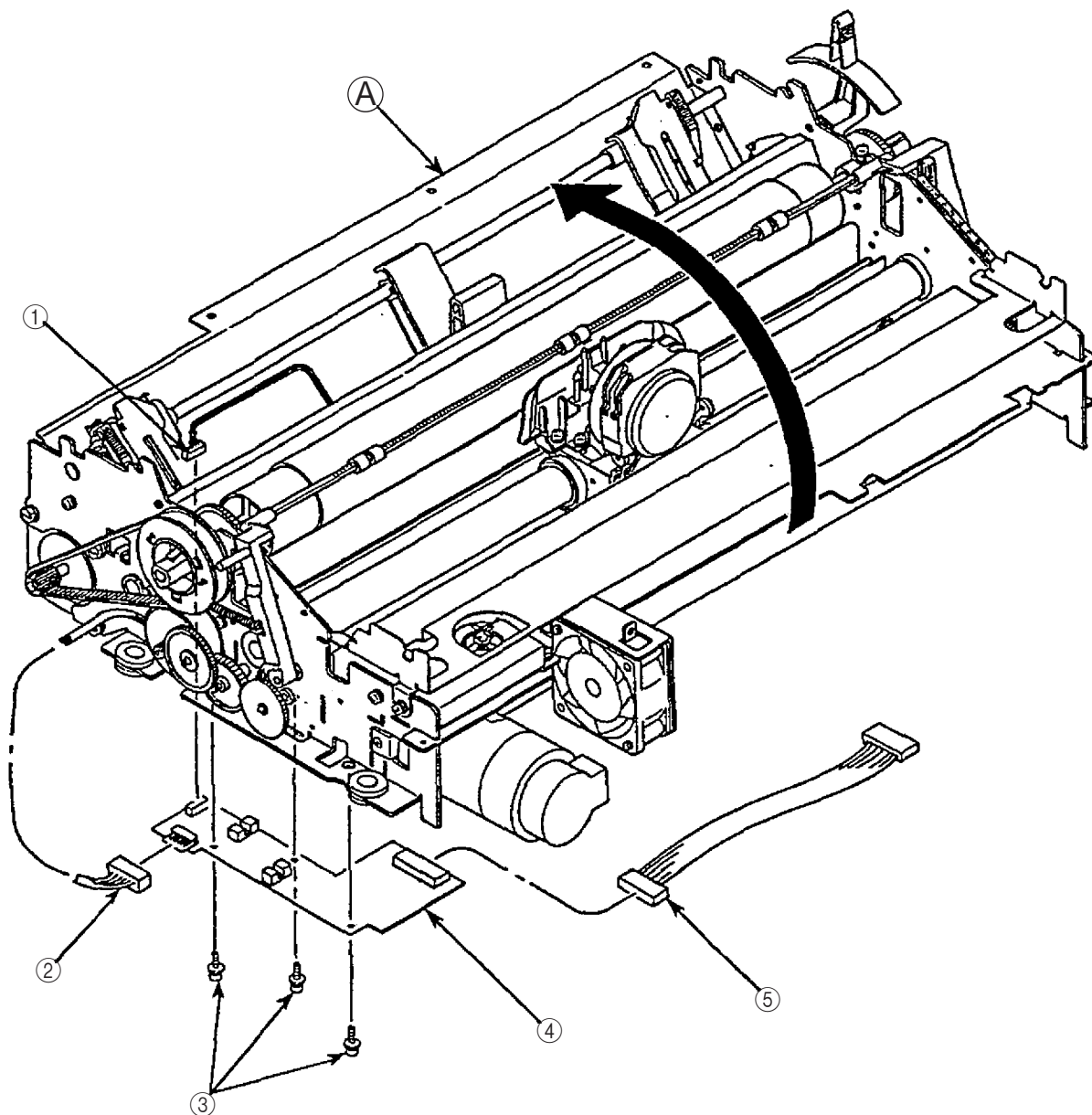
[Note on installation]

- (1) Be sure to install cable guide ⑪ so that some clearance will be left between headcable ⑫ at the bent portion.



3.3.12 Sensor Board

- (1) Remove the printer mechanism. (See section 3.3.8.)
- (2) Disconnect cables CN1 ① and CN2 ② connected to sensor board ④.
- (3) Raise the printer mechanism by 90° using its portion ①A as a supporting point.
- (4) Remove three screws ③, and remove sensor board ④.
- (5) Disconnect cables CN3 ⑤ connected to sensor board ④.
- (8) To install, reverse the removal procedure sequence.

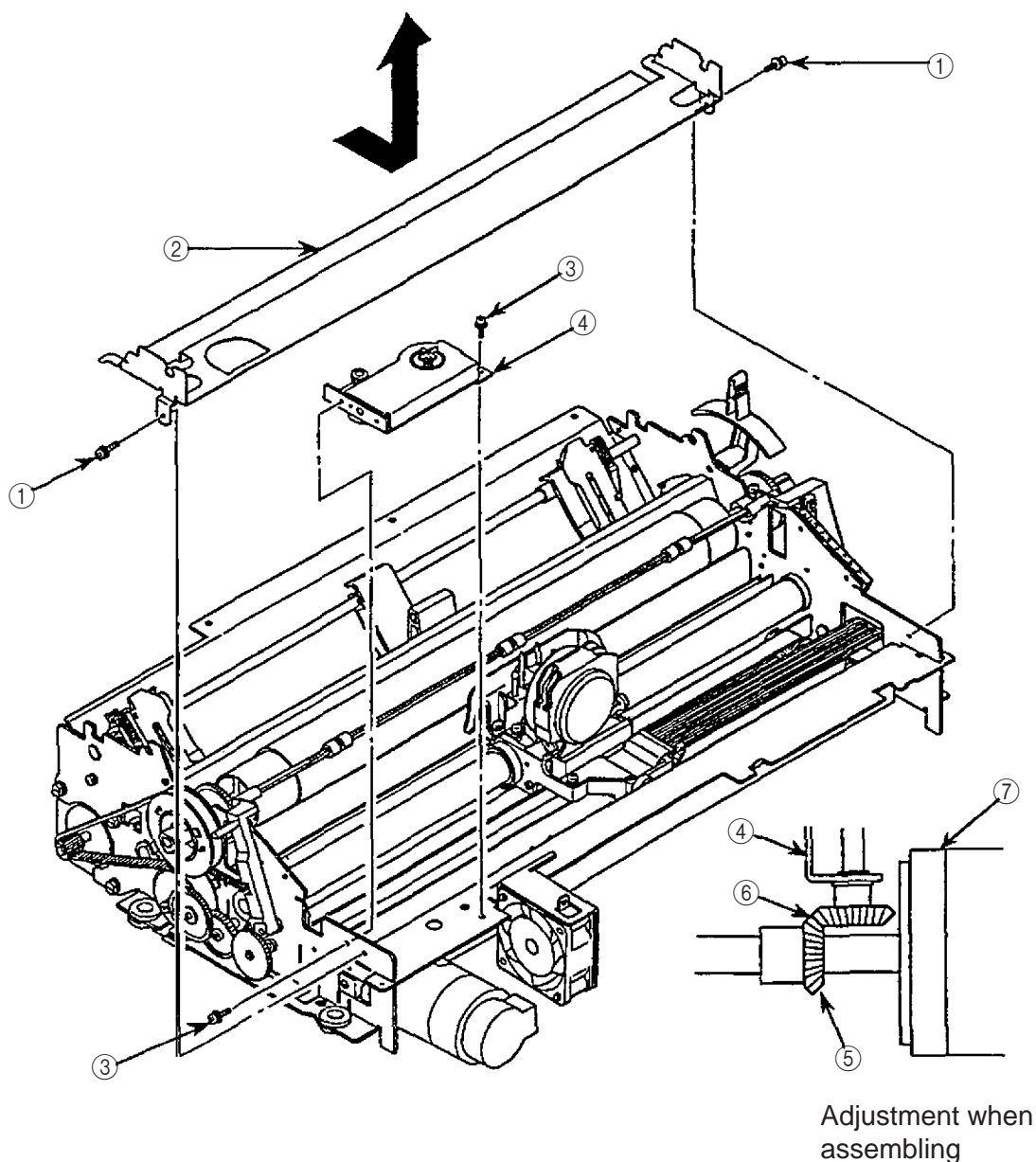


3.3.13 Ribbon Feed Assembly

- (1) Remove the printer mechanism. (See section 3.3.8.)
- (2) Remove two screws ①, and remove cartridge bracket ② by pulling it to the front.
- (3) Remove two screws ③, and remove ribbon feed assembly ④.
- (4) To install, reverse the removal procedure sequence.

[Note on installation]

- (1) Adjust the backlash between bevel gear ⑤ of space motor ⑦ and bevel gear ⑥ of ribbon feed assembly ④. (See section 4.4.)

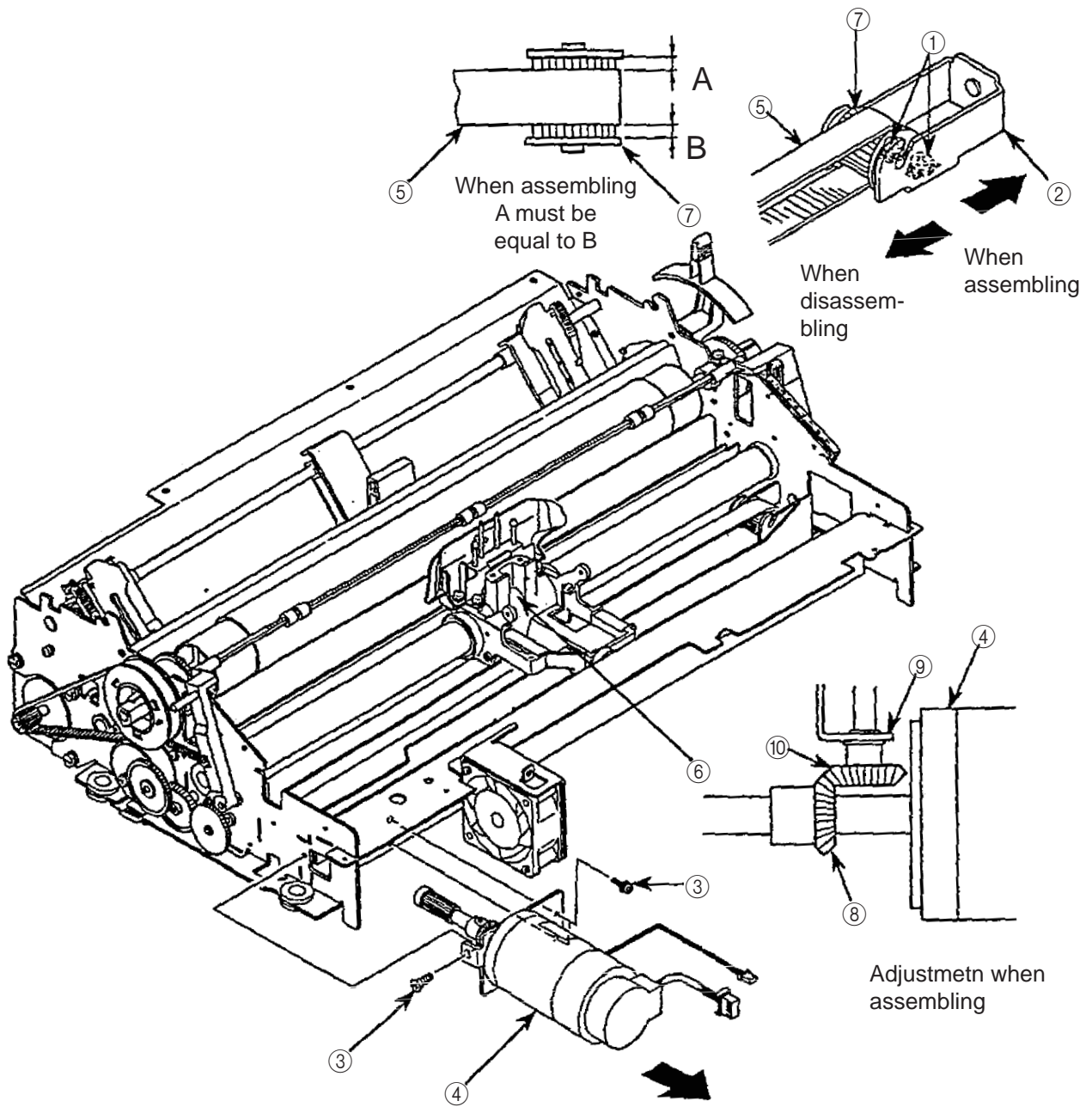


3.3.14 Space Motor Assembly

- (1) Remove the ribbon feed assembly. (See section 3.3.13.)
- (2) Loosen two screws ①, press belt pulley bracket ② to the left to slacken space belt ⑤ then tighten screws ① temporarily.
- (3) Remove three screws ③.
- (4) Draw out space motor ④ forward.
- (5) To install, reverse the removal procedure sequence.

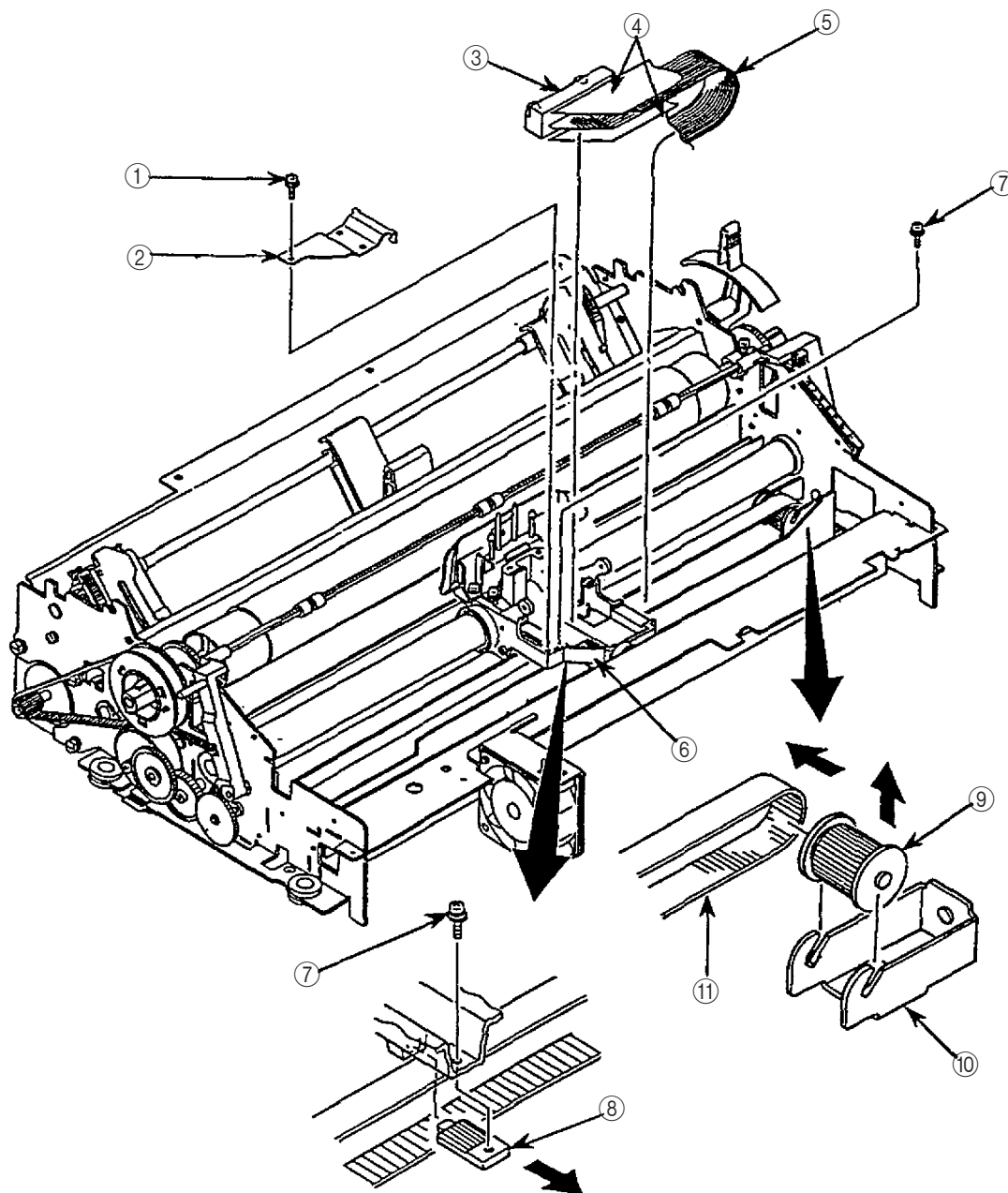
[Notes on installation]

- (1) After installing space motor ④, loosen screws ① and tense space belt ⑤, then partially tighten screws ①.
- (2) Adjust the position of pulley bracket ② so that space belt ⑤ is positioned at the center of belt pulley ⑦ when carriage frame ⑥ is moved left and right by hand, before tightening the screws.
- (3) Adjust the backlash of bevelgears, ⑧, ⑩ of space motor assembly ④ and ribbon feed assembly ⑨. (See section 4.4.)



3.3.15 Space Belt

- (1) Remove the space motor assembly. (See section 3.3.14.)
- (2) Remove screw ① and connector clamp ②.
- (3) Remove connector ③, cable guide ④ and head cable ⑤ from carriage frame ⑥.
- (4) Remove screw ⑦ and belt clamp ⑧.
- (5) Remove idle pulley ⑨ from idle pulley bracket ⑩ and remove space belt ⑪.
- (6) To install, reverse the removal procedure sequence.

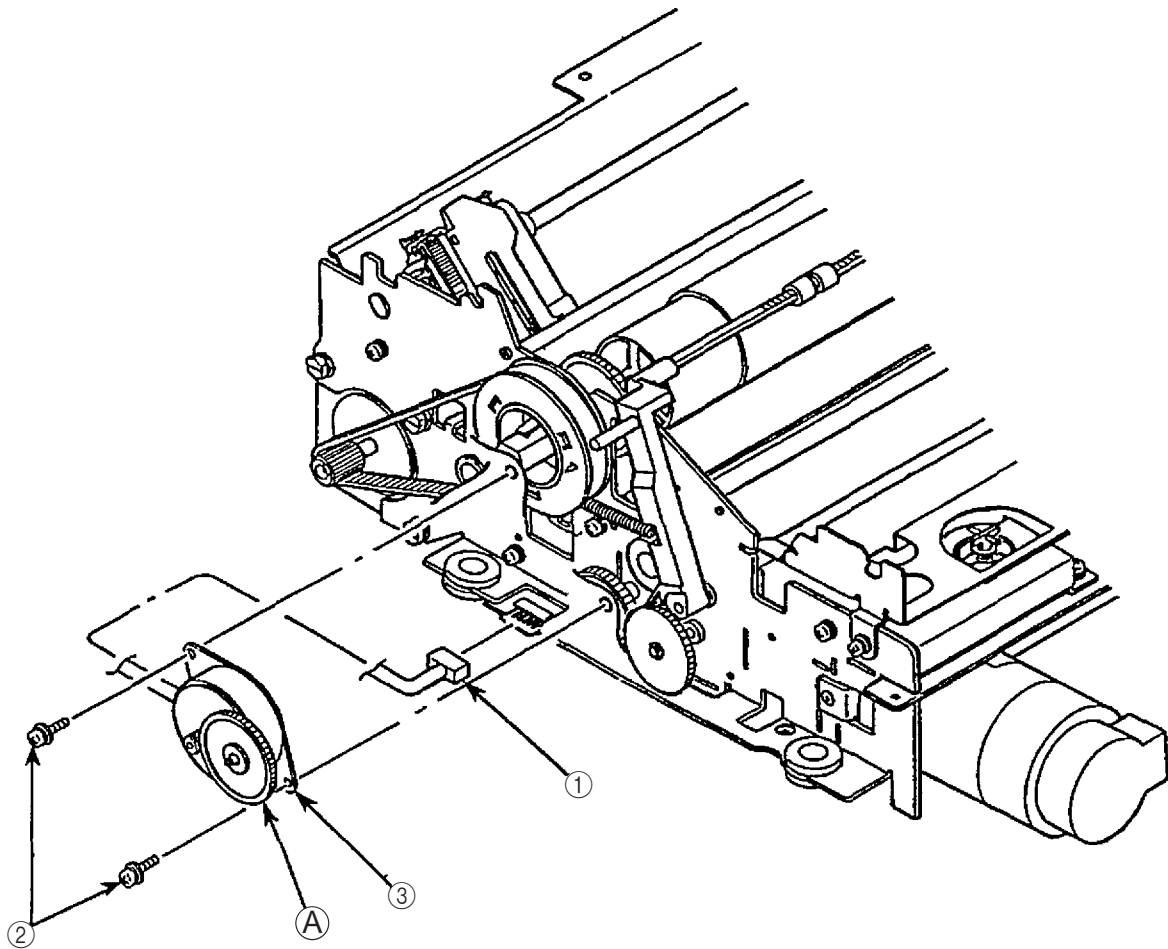


3.3.16 Bail/Ribbon Motor Assembly

- (1) Remove the printer mechanism. (See section 3.3.8.)
- (2) Disconnect cable CN2 ①.
- (3) Remove two screws ②, and remove bail/ribbon motor assembly ③.
- (4) To install, reverse the removal procedure sequence.

[Note on installation]

- (1) Adjust the backlash of gear ④. (See section 4.3.)

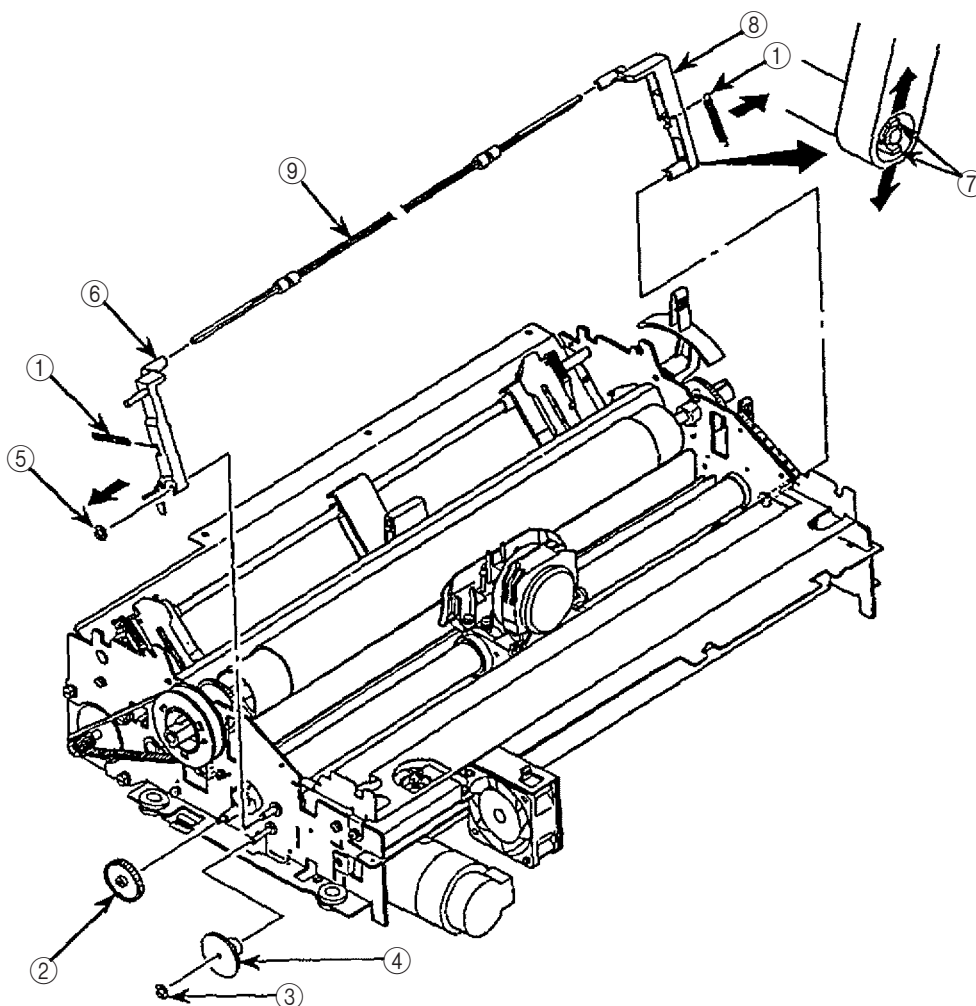


3.3.17 Paper Bail Assembly

- (1) Remove the bail/ribbon motor assembly. (See section 3.3.16.)
- (2) Remove two springs ①.
- (3) Remove idle gear ②.
- (4) Remove one "E" snap ring ③, and remove bail open cam ④.
- (5) Remove one "E" snap ring ⑤, and remove bail arm L ⑥ to the left while drawing it from paper bail bar ⑨.
- (6) Remove bail arm R ⑧ to the right while expanding clamp ⑦ outward.
- (7) To install reverse the removal procedure sequence.

[Note on installation]

- (1) Since the shape of the spring ① for the right side is different from that for the left side, be careful not to install the spring ① for the right side to the left side and that for the left side to the right side.

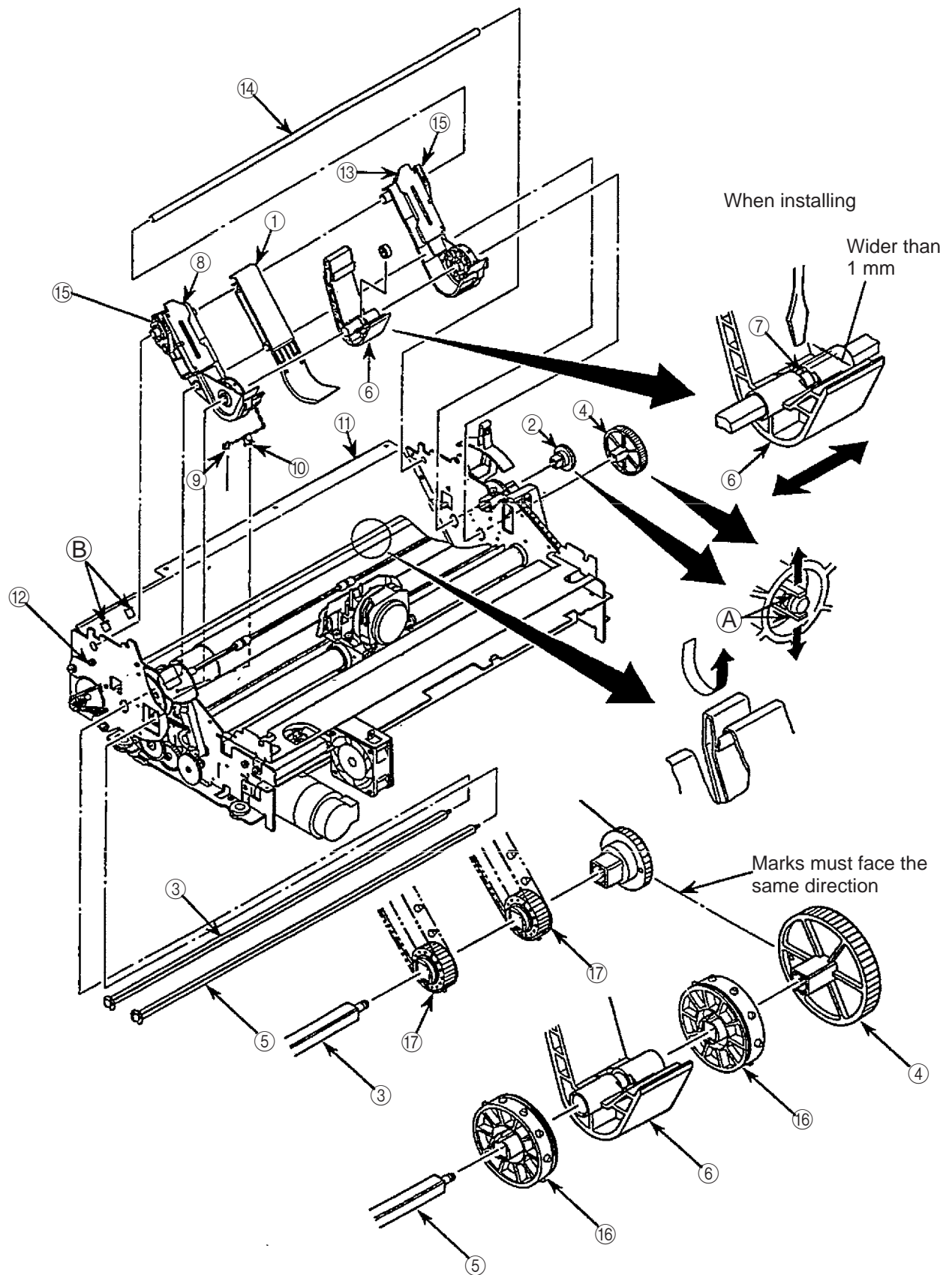


3.3.18 Push Tractor Assembly

- (1) Remove the bail/ribbon motor assembly. (See section 3.3.16.)
- (2) Remove center guide lower ①.
- (3) Remove drive gear B ② by expanding its clamp ○ in the direction of the arrow, and draw out guide shaft B ③.
- (4) Remove drive gear A ④ by expanding its clamp ○ in the direction of the arrow, and draw out guide shaft C ⑤. Center guide upper ⑥, friction piece ⑦ will come off together.
- (5) Disconnect paper end microswitch cable connector ⑨ of push tractor assembly (L) ⑧ and cable clamp ⑩ from base frame ⑪.
- (6) Loosen two screws ⑫ on left and right side, then remove push tractor assembly (L) ⑧ and (R) ⑬, together with guide shaft A ⑭.
- (7) Loosen lock lever ⑮, then draw out push tractor assembly (L) ⑧ and (R) ⑬.
- (8) To install, reverse the removal procedure sequence.

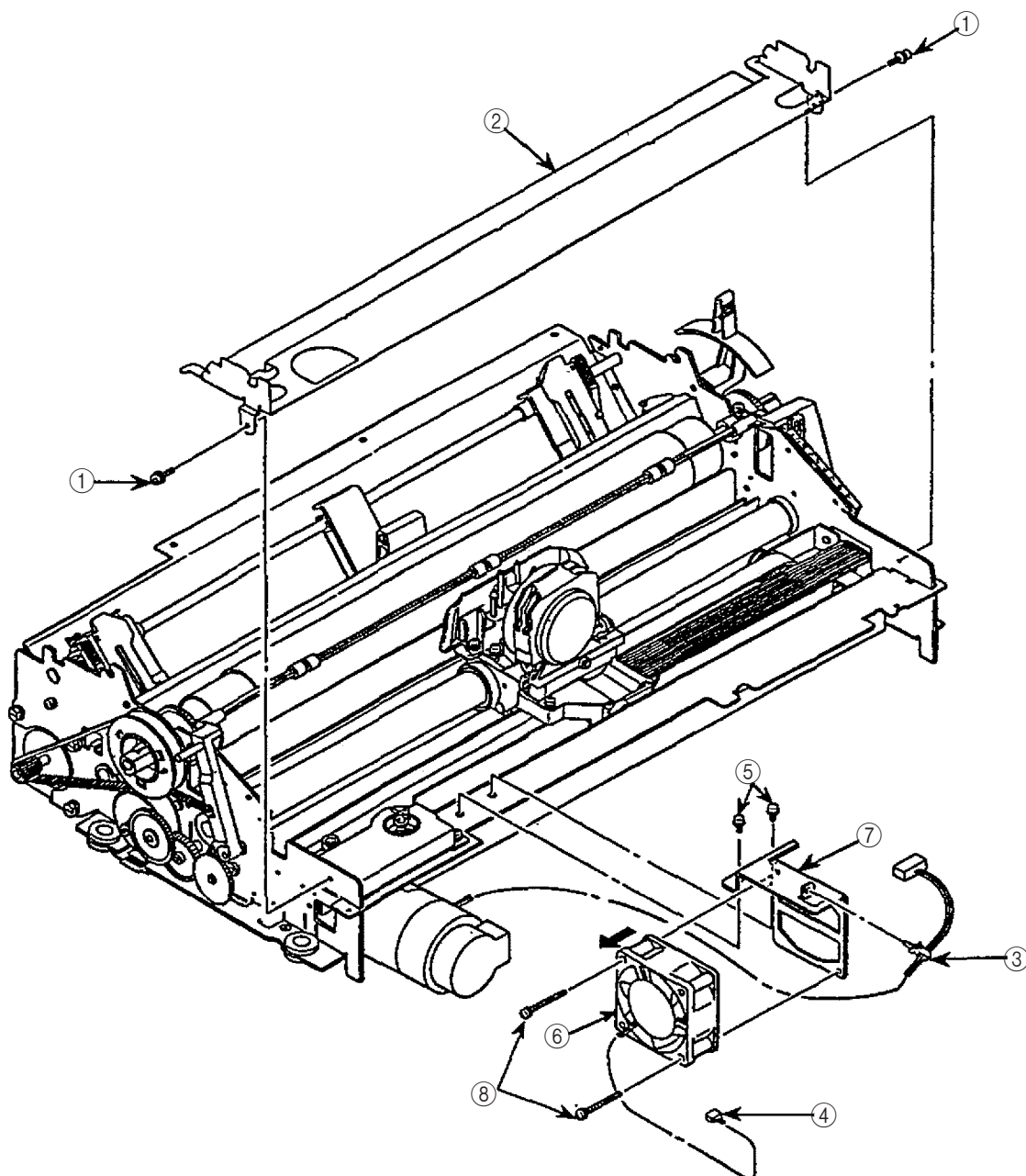
[Notes for installation]

- (1) Install push tractor assembly (L) ⑧ fitted correctly between two projections ⑯.
- (2) Install guide shaft B ③ and C ⑤ by the following procedure:
 - (a) Set the projections of left and right pin tractor wheels ⑰ and a hole of drive gear A ④ to face the same direction. Center guide upper ⑥ with friction piece ⑦ between left and right pin tractor wheels ⑰. Then insert guide shaft C ⑤.
 - (b) Set the projections of left and right pin tractor wheels ⑱ to face the same direction and insert guide shaft B ③.
 - (c) Set the projections of left and right pin tractor wheels ⑲ and a hole of drive gear B ② to face the same direction, and engage drive gears B ② and A ④ by setting the holes on them to face each other. Then install drive gear B ② on guide shaft B ③.
- (3) Rotate friction piece ⑦ by 45° with standard screwdriver to give friction. (Try to slide center guide upper ⑥ left and right: If friction is felt, installation is correct; if it slides smoothly, installation is incorrect.)





3.3.19 Cooling Fan

- (1) Remove the printer mechanism. (See section 3.3.6.)
- (2) Remove two screws ①, then remove ribbon cartridge bracket ②.
- (3) Remove cable clamp ③ and connector cable ④.
- (4) Remove two screws ⑤, then remove the cooling fan ⑥ together with fan cover ⑦.
- (5) Remove two screws ⑧, and then remove the cooling fan ⑥ in the arrow direction.
- (6) To install, reverse the removal procedure sequence.



3.3.20 Power Supply Unit

 Warning	Risk of Electric Shock	
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There is a risk of electric shock during replacement of the power supply.

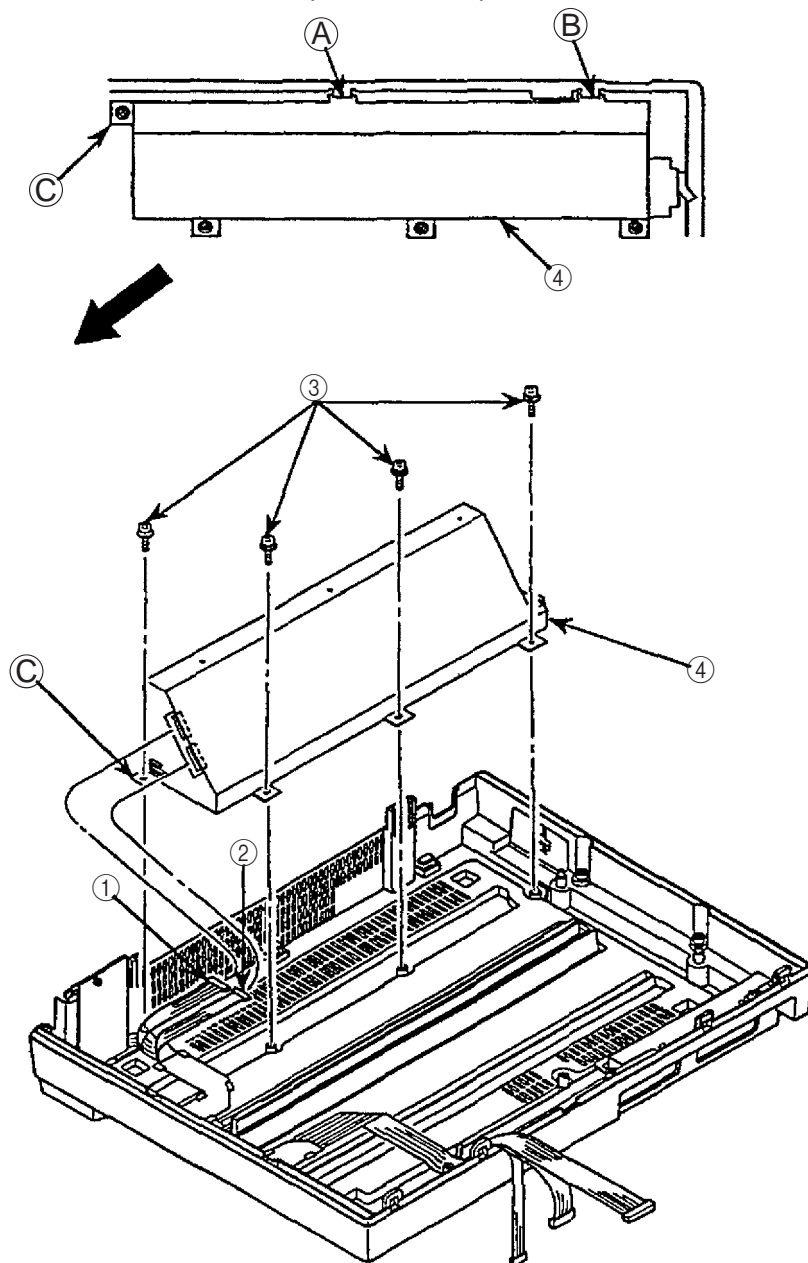
Use insulating gloves or avoid direct contact with any conducting part of the power supply, and caution should be exercised during replacement.

The capacitor may take one minute to complete discharge after the AC cable is unplugged. Also, there is a possibility that the capacitor doesn't discharge because of a breakage of the PCB, etc., so remember the possibility of electric shock to avoid electric shock.

- (1) Remove the printer mechanism. (See section 3.3.8.)
- (2) Disconnect two cables ① and ② from the left side face of power supply unit ④.
- (3) Remove four screws ③.
- (4) Draw out power supply unit ④ toward the left front while raising it a little so that it will come off guides A and B of the lower cover.

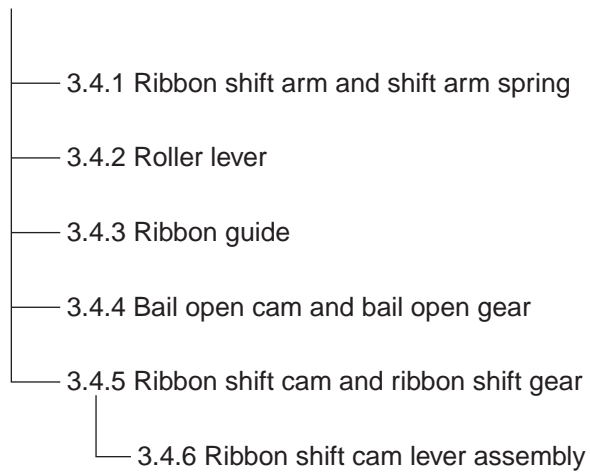
Do not damage cables ①, ② with portion C of power supply unit ④.

- (5) To install, reverse the removal procedure sequence.



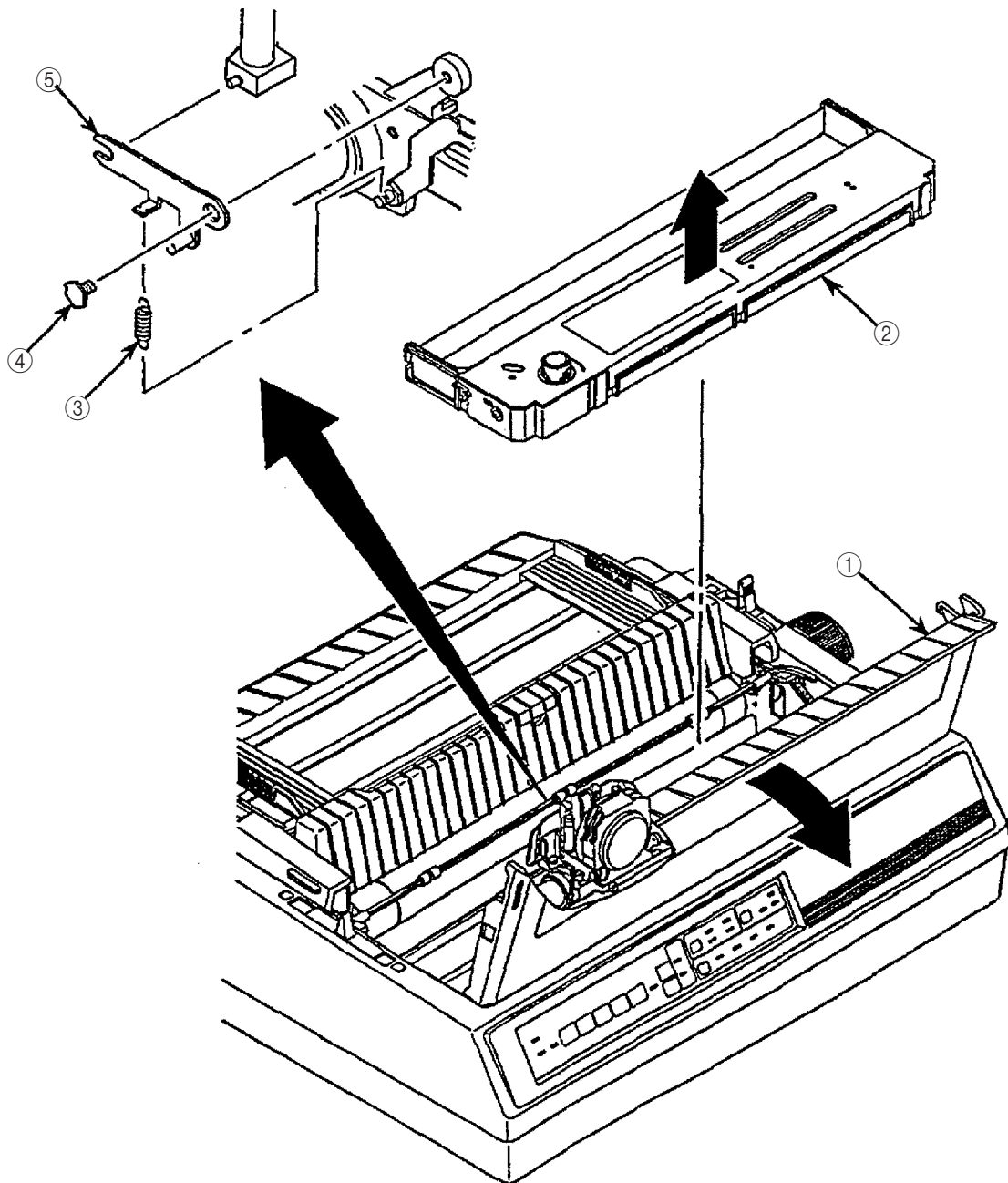
3.4 Assembly/Disassembly Procedure for Color Model

The assembly replacement procedure for color model is explained in the following disassembly sequence.



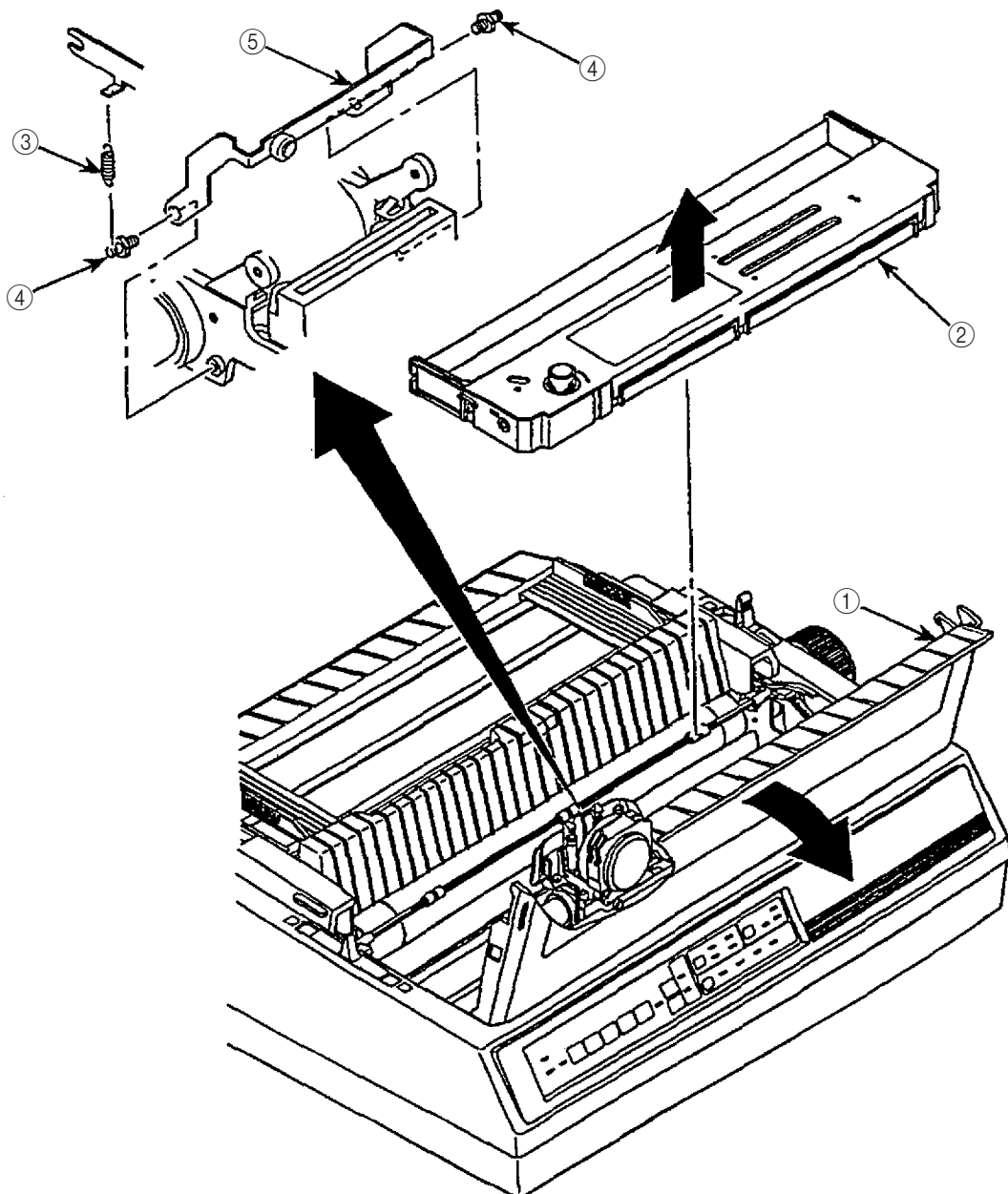
3.4.1 Ribbon Shift Arm, and Shift Arm Spring

- (1) Open access cover ①.
- (2) Remove ribbon cartridge ②.
- (3) Remove shift arm spring ③.
- (4) Remove screw ④, and remove ribbon shift arm ⑤.
- (5) To install, reverse the removal procedure sequence.



3.4.2 Roller Lever

- (1) Open access cover ①.
- (2) Remove ribbon cartridge ②.
- (3) Remove shift arm spring ③.
- (4) Remove two screws ④, and remove roller lever ⑤.
- (5) To install, reverse the removal procedure sequence.

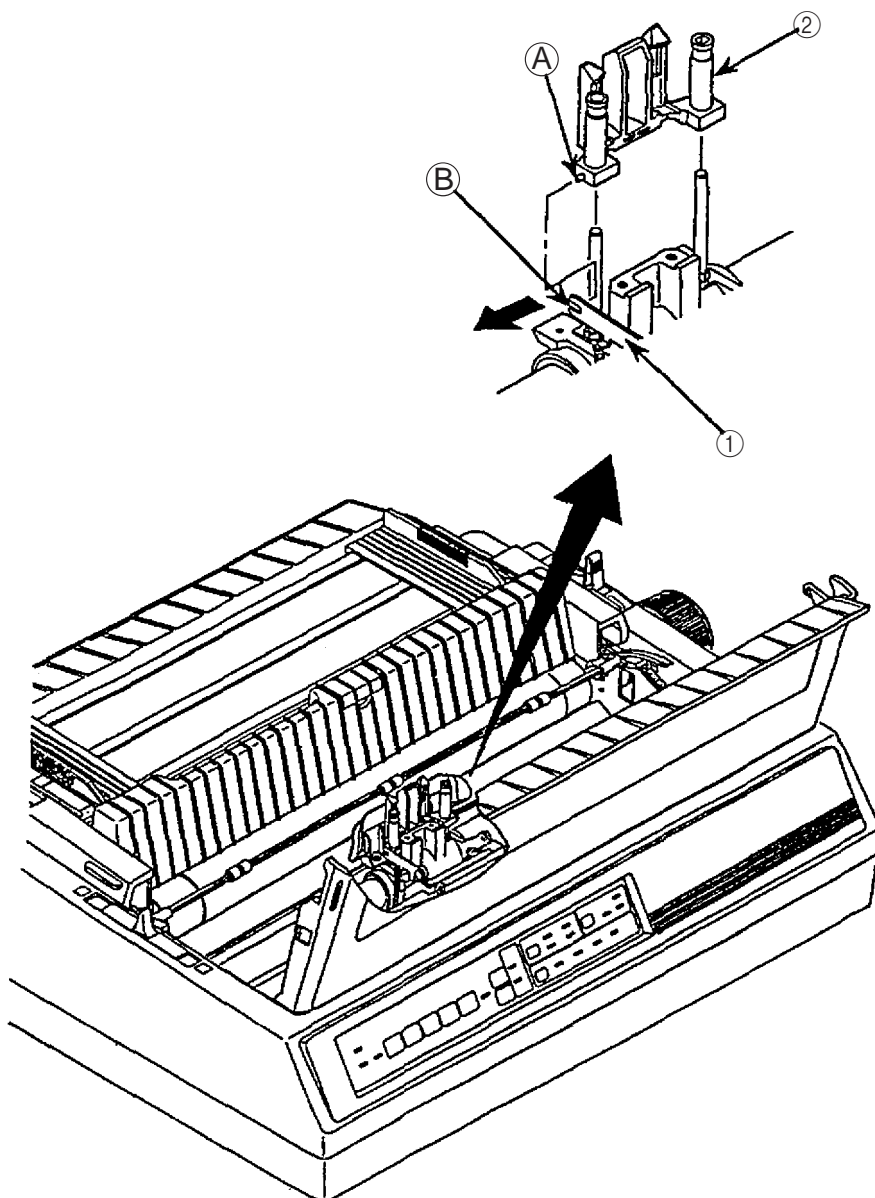


3.4.3 Ribbon Guide

- (1) Remove the printhead. (See section 3.3.1.)
- (2) Draw out ribbon guide ② upward by first moving ribbon shift arm ① to the left, then removing it from projection ① of ribbon guide ②.
- (3) To install, reverse the removal procedure sequence.

[Note on installation]

- (1) Fit the left side projection ① of ribbon guide ② into cutout portion ② at the end of ribbon shift arm ①.

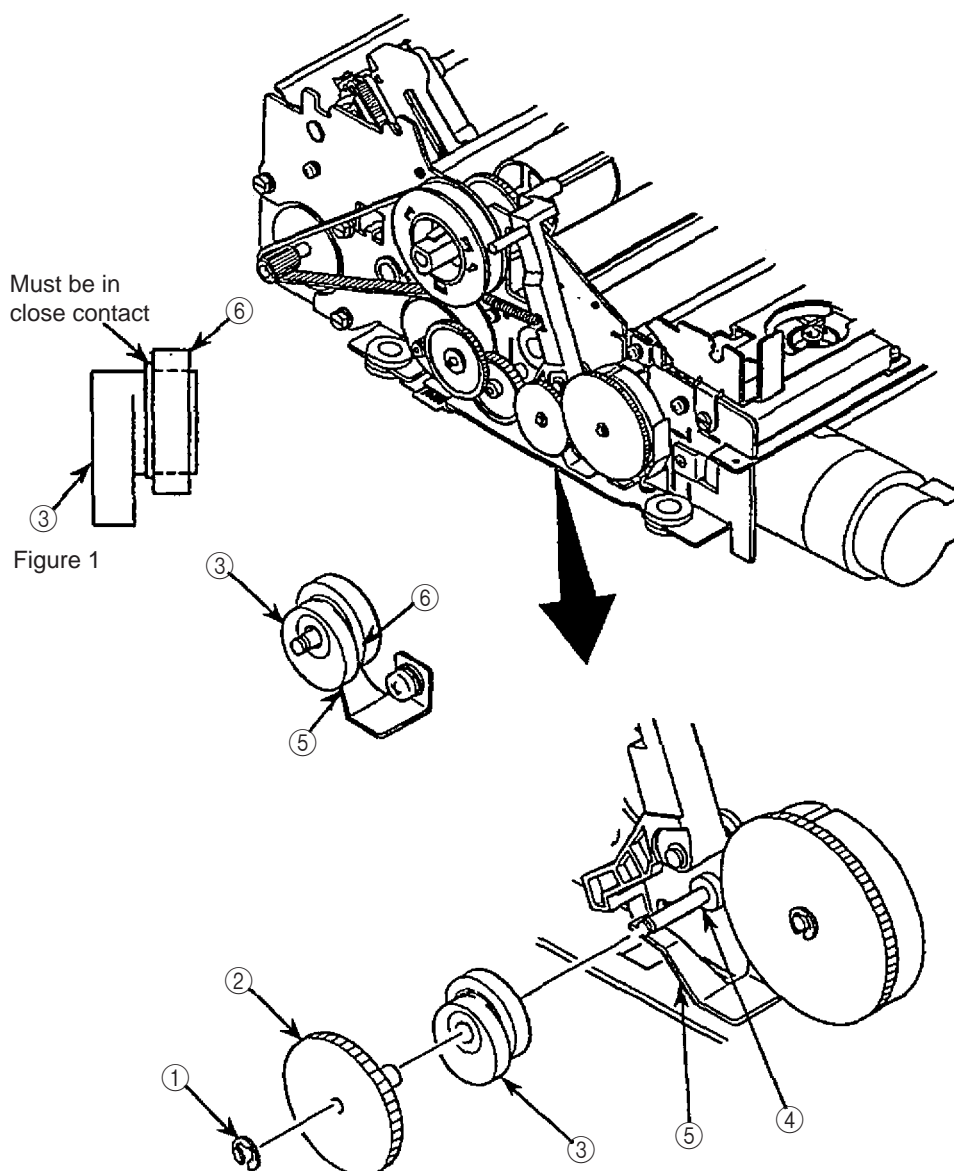


3.4.4 Bail Open Cam and Bail Open Gear

- (1) Remove the printer mechanism. (See section 3.3.8.)
- (2) Remove "E" snap ring ①, and remove bail open gear ② and bail open cam ③ from shaft ④. Fix the friction urethane foam ring ⑥ on the bail open cam ③ beforehand. (See Figure 1).
- (3) To install, reverse the removal procedure sequence.

[Notes on installation]

- (1) Installation may be easier if bail open cam ③ is installed first, and bail open gear ② is fitted next.
- (2) Bail open cam ③ must be inserted into spring ⑤.

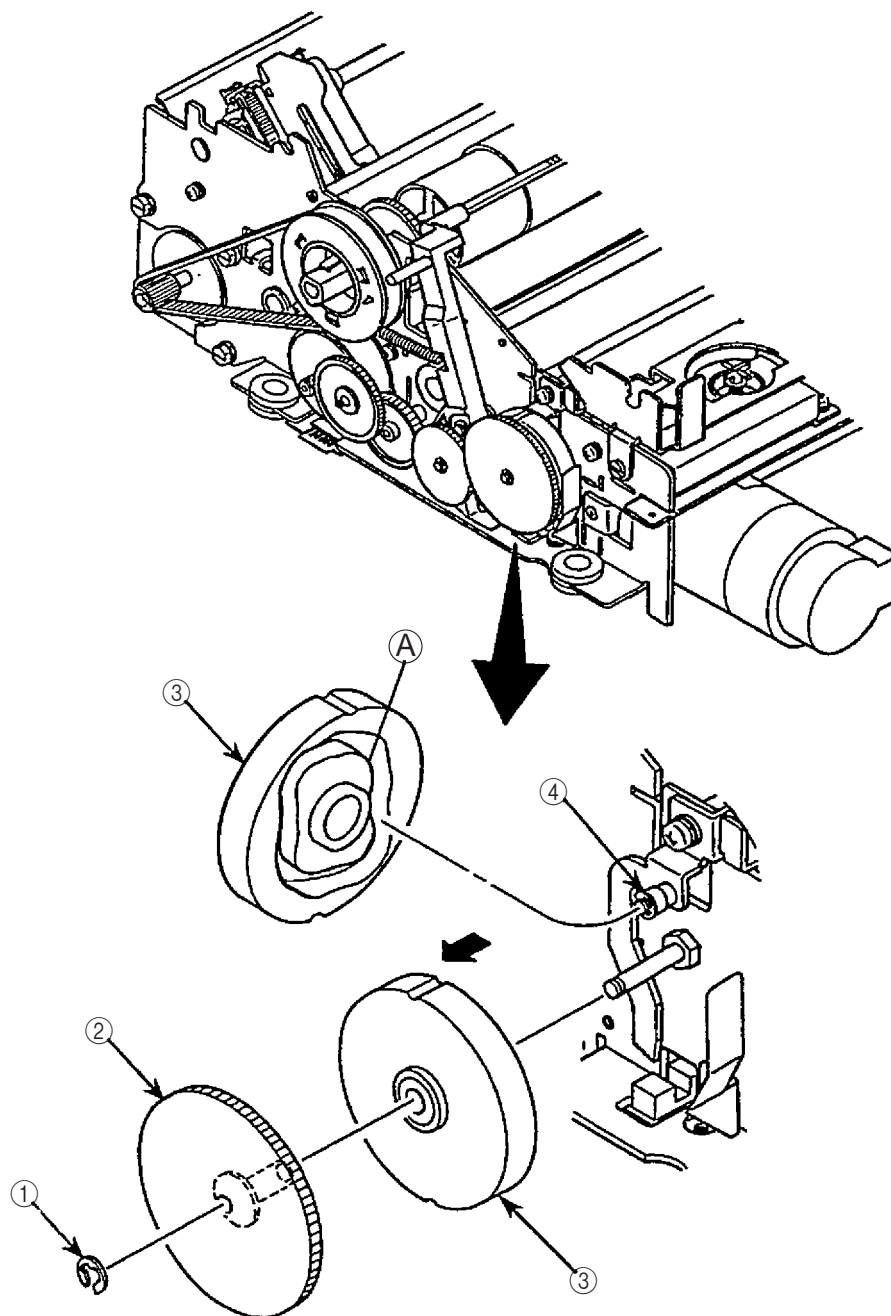


3.4.5 Ribbon Shift Cam and Ribbon Shift Gear

- (1) Remove the printer mechanism. (See section 3.3.8.)
- (2) Remove “E” snap ring ①, then remove ribbon shift gear ② and ribbon shift cam ③.
- (3) To install, reverse the removal procedure.

[Note on installation]

- (1) Roller ④ must be put in groove ○ of ribbon shift cam ③.



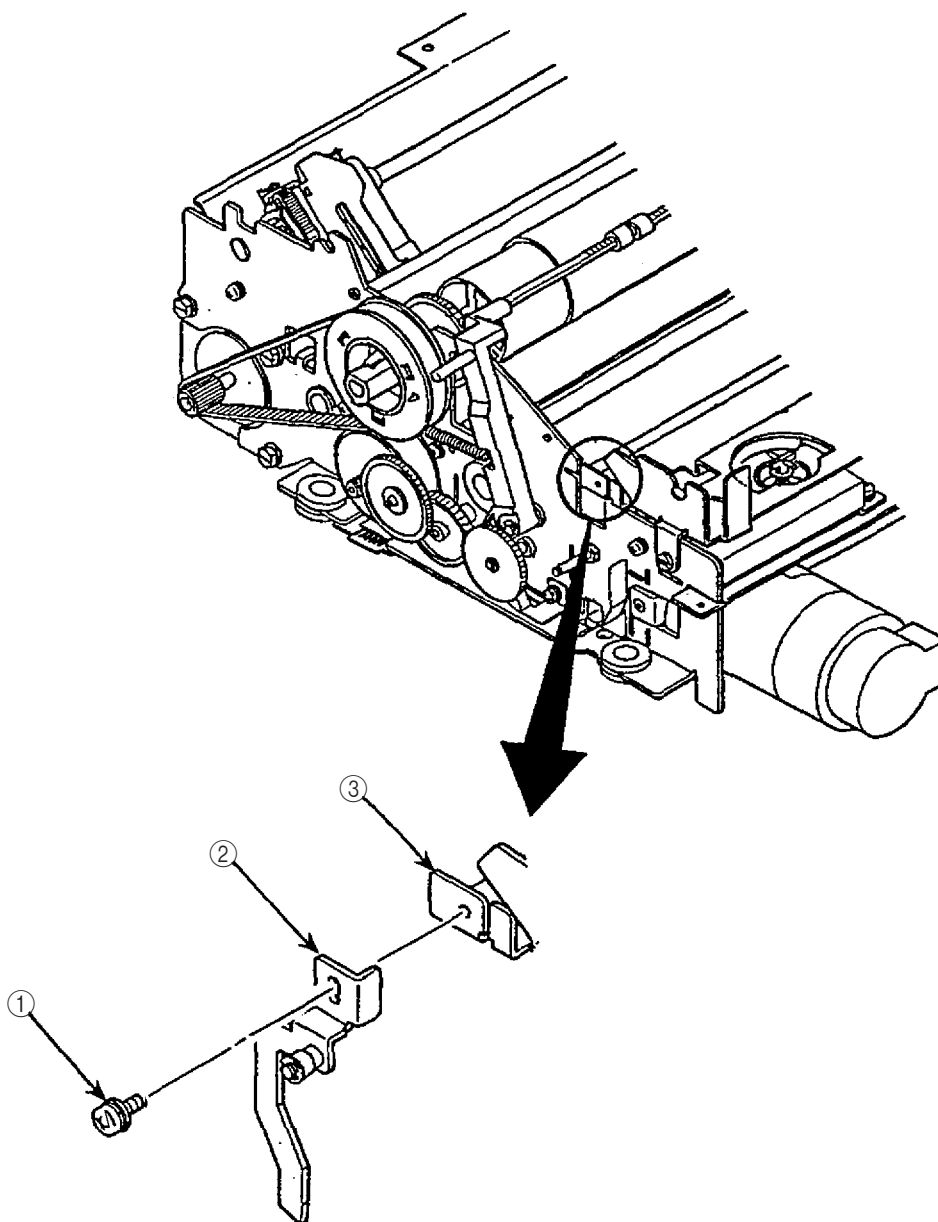
3.4.6 Ribbon Shift Cam Lever Assembly

- (1) Remove the printer mechanism. (See section 3.3.8.)
- (2) Remove the ribbon shift cam and ribbon shift gear. (See section 3.4.5.)
- (3) After removing screw ①, remove ribbon shift cam lever ② from cartridge bracket ③.
- (4) To install, reverse the removal procedure sequence.

[Note on installation]

- (1) The following adjustment is needed when installing.

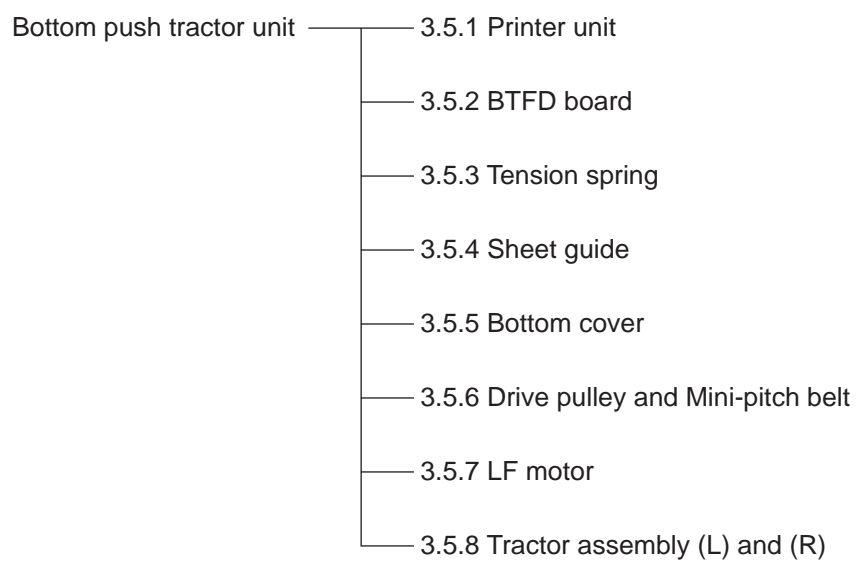
Adjust the ribbon guide height and the gap between shift cam lever and color shift sensor. (See section 4.6.)



3.5 Bottom Push Tractor Unit (Option)

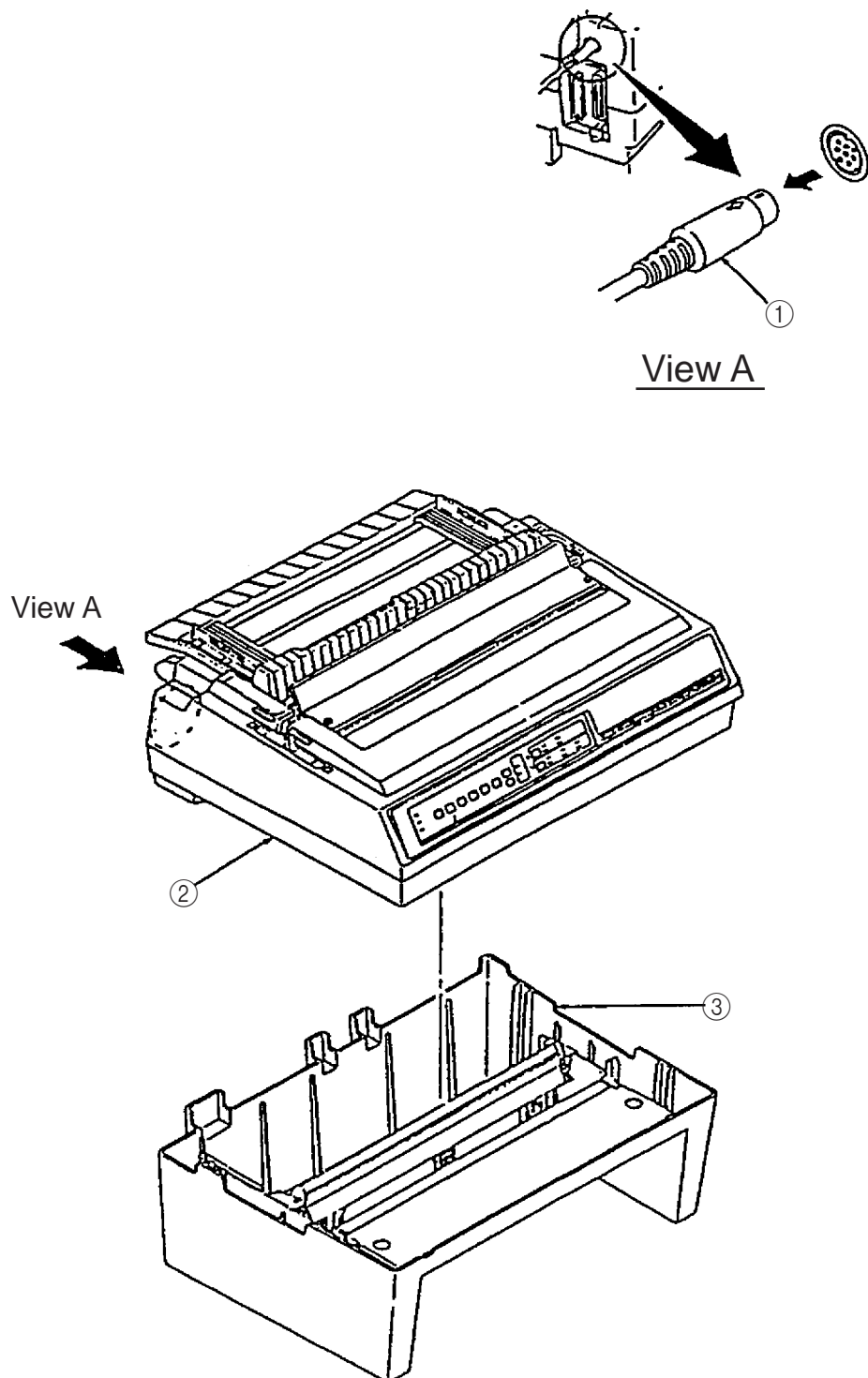
How to Change Parts of Bottom Push Tractor Unit (Option)

This section explains how to change parts and assemblies appearing in the disassembly diagram below.



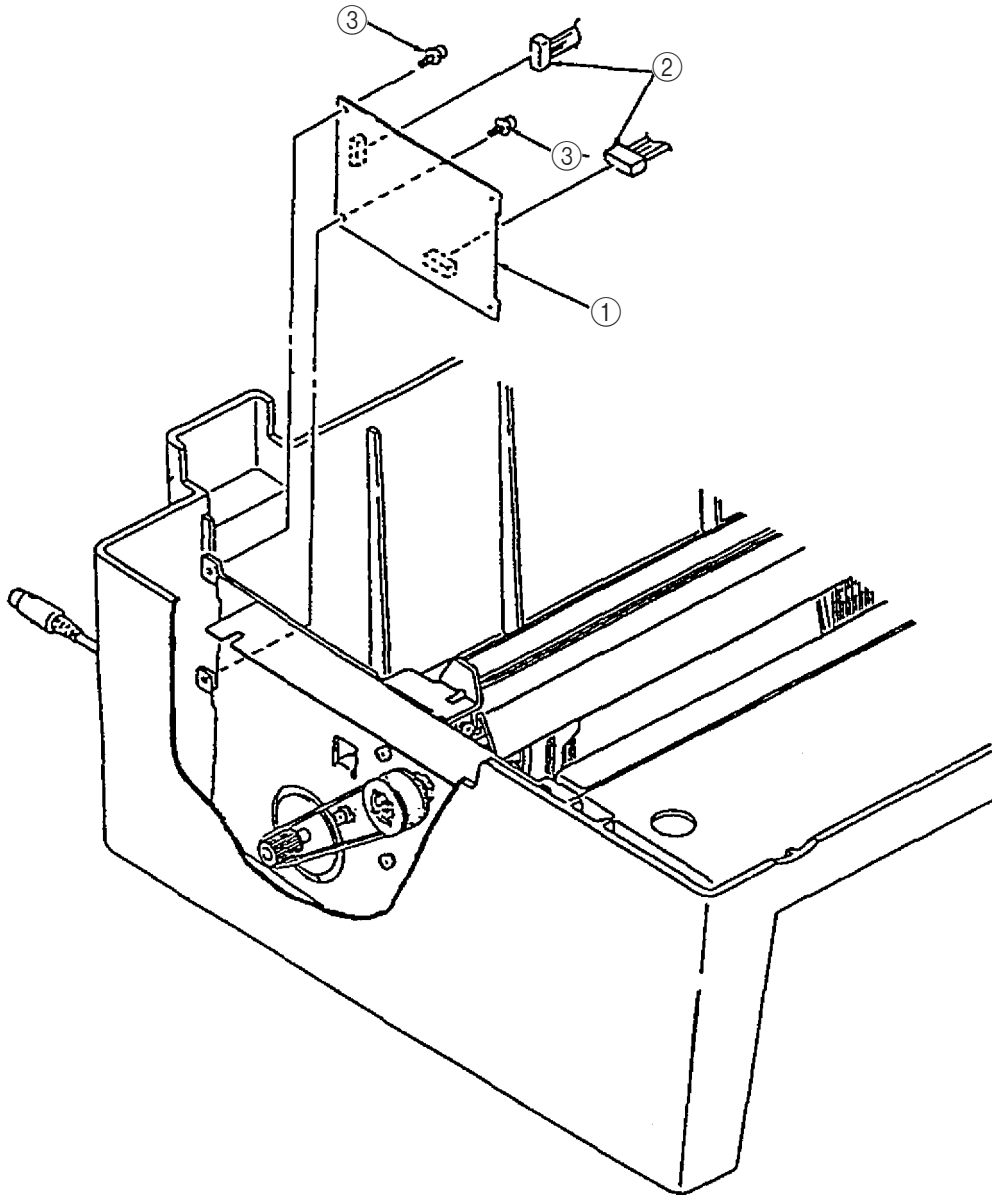
3.5.1 Printer Unit

- (1) Turn the power switch off and unplug the AC power cord from the outlet.
- (2) Remove the DIN connector ① and lift the printer unit ② out of the bottom push tractor ③.



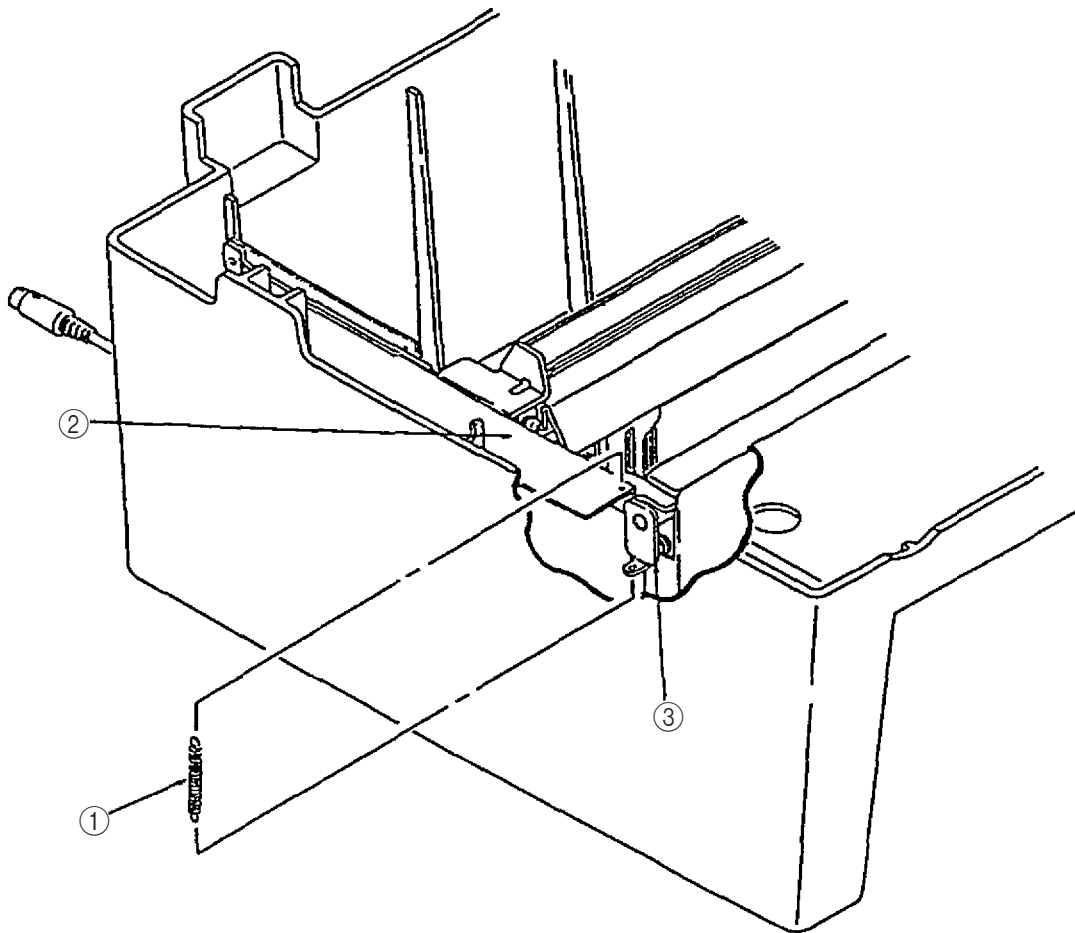
3.5.2 BTFD Board

- (1) Remove the printer unit. (See 3.5.1.)
Disconnect ② CN1 and CN2 of the ① BTFD board.
- (3) Remove the two screws ③ and BTFD board ①.



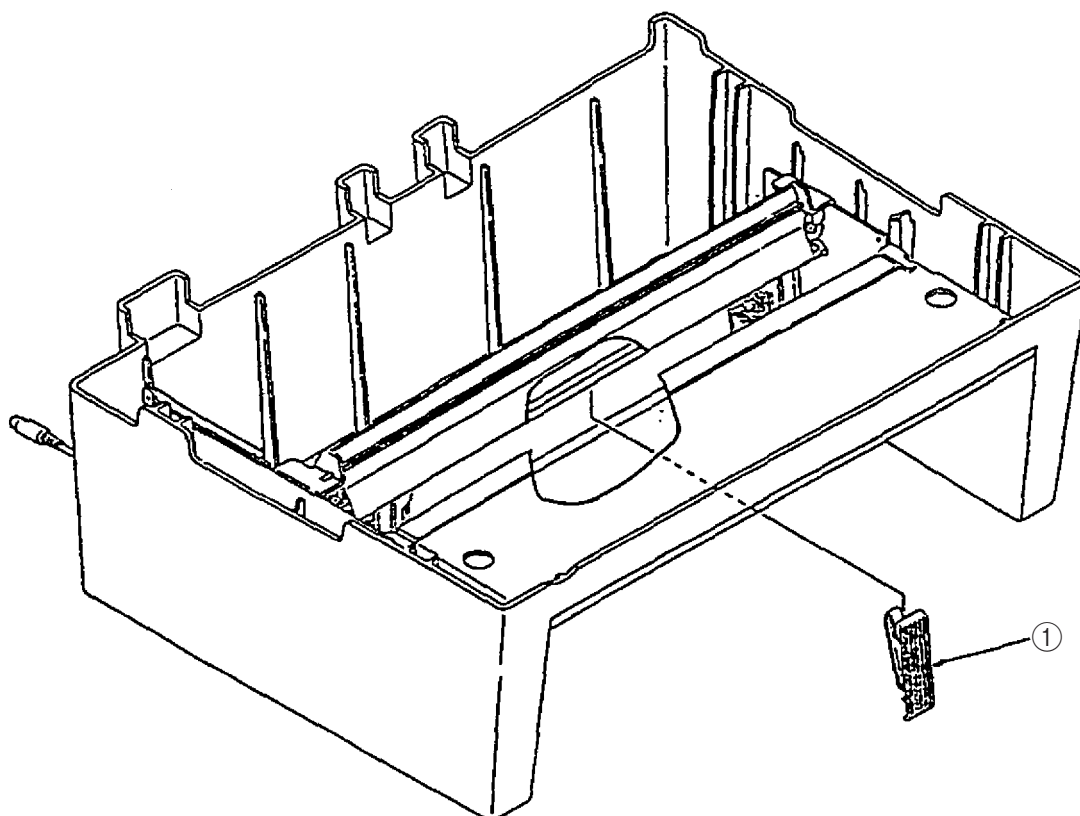
3.5.3 Tension Spring

- (1) Remove the printer unit. (See 3.5.1.)
- (2) Remove the junction between the tension spring ① and blind plate ② and remove the junction between the bottom cover ③ and the tension spring ①.



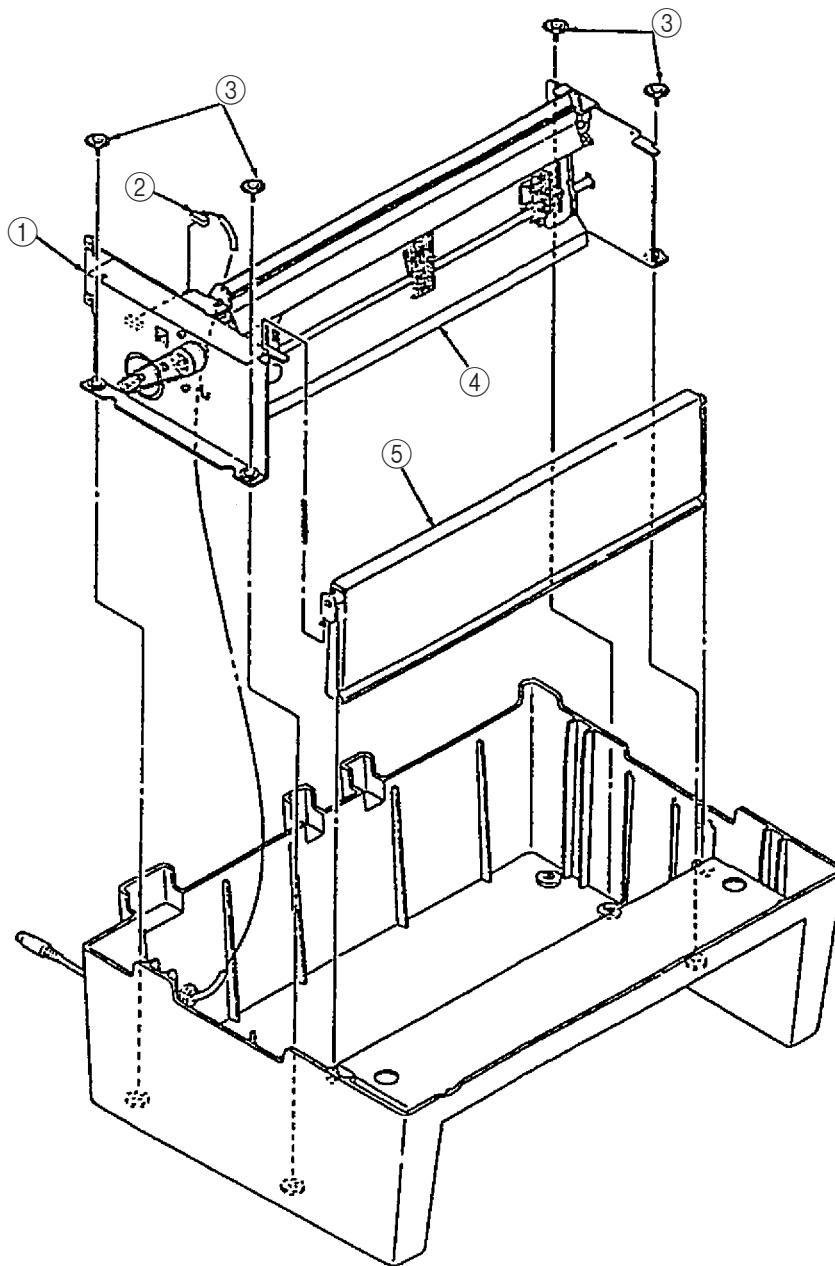
3.5.4 Sheet Guide

- (1) Remove the printer unit. (See 3.5.1.)
- (2) Remove the lock and the sheet guide ①.



3.5.5 Bottom Cover

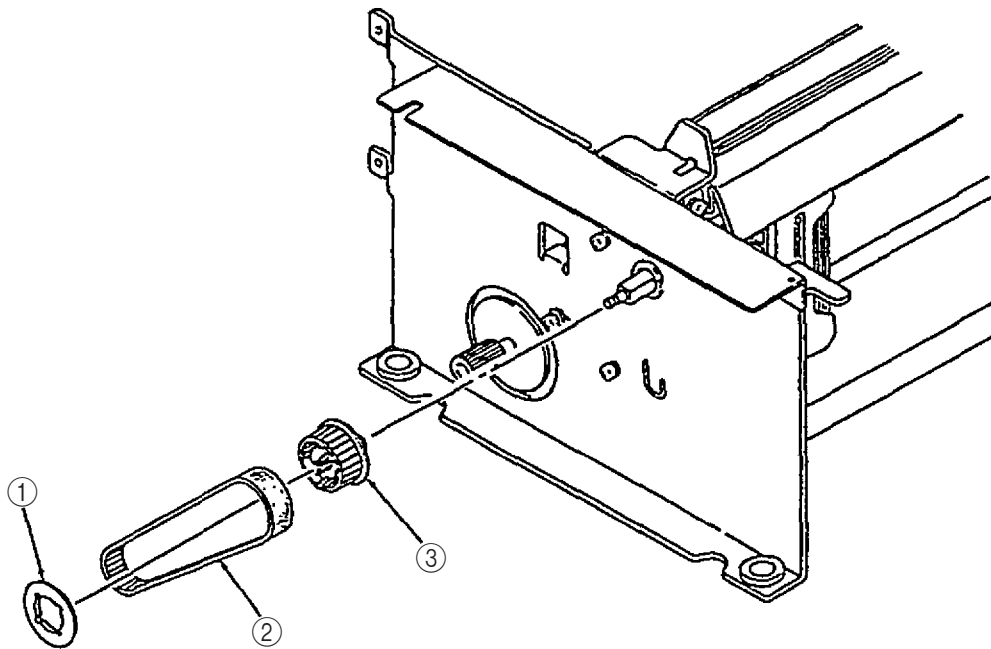
- (1) Remove the printer unit. (See 3.5.1.)
- (2) Remove the CN1 connecting cable ② on the BTFD board ①.
- (3) Remove the Tension Spring. (See 3.5.3.)
- (4) Remove the four screws ③ and the bottom push mechanism ④.
- (5) Remove the bottom cover ⑤.



3.5.6 Drive Pulley and Mini-pitch Belt

- (1) Remove the printer unit. (See 3.5.1.)
- (2) Remove the bottom push mechanism. (See steps (2), (3), (4) in 3.5.5.)
- (3) Remove the lock and flange ① of drive pulley ③.
- (4) Remove mini-pitch belt ②.
- (5) Remove drive pulley ③.

Note: when removing mini-pitch belt only, it is necessary to remove the flange ① only.

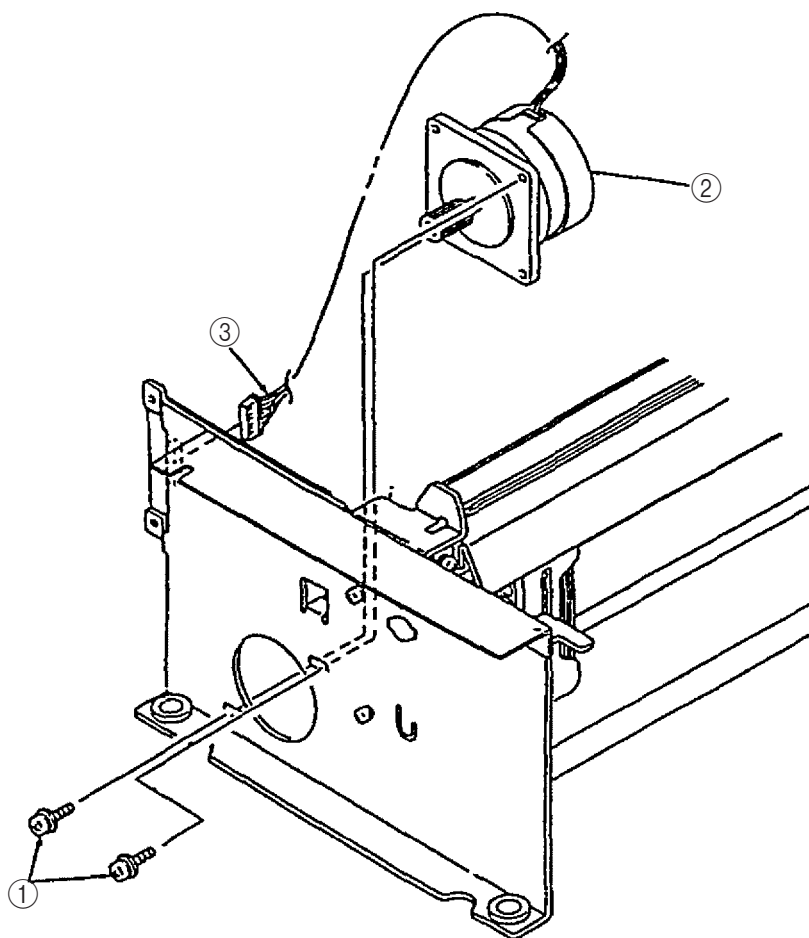


3.5.7 LF Motor

- (1) Remove the printer unit. (See 3.5.1.)
- (2) Remove the bottom push mechanism. (See steps (2), (3), (4) in 3.5.5.)
- (3) Remove the CN2 connecting cable ③ in the BTFD board.
- (4) Remove the two screws ① and the LF motor ②.

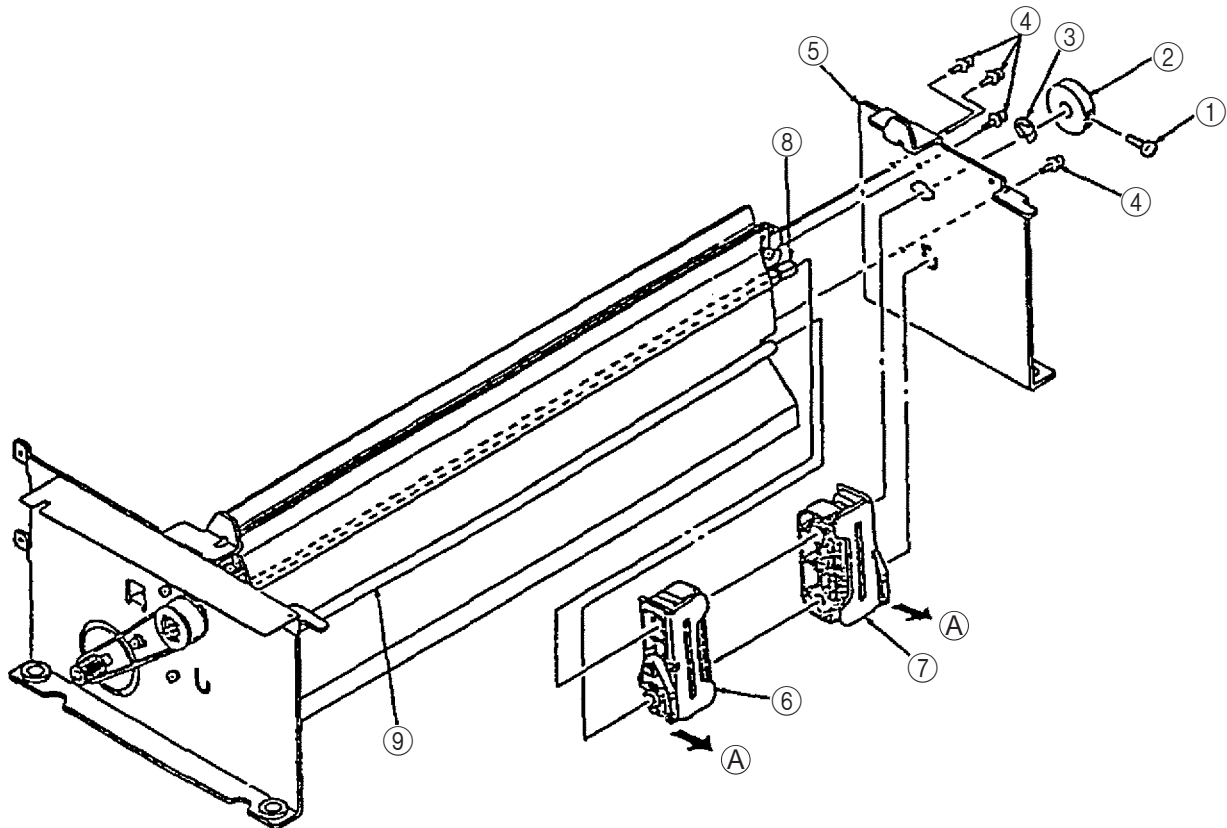
[Installation]

Adjust the tension of the mini-pitch belt when the LF motor is installed. (See 4.7.)



3.5.8 Tractor Assembly (L) and (R)

- (1) Remove the printer unit. (See 3.5.1.)
- (2) Remove the bottom push mechanism. (See steps (2), (3), (4) in 3.5.5.)
- (3) ①, move balancers ②, E-clip ③, ④ and the sid frame (R) ⑤.
⑥ the lock lever of the tractor assembly(L)
Ⓐ arrow.
- (5) Remove the tractor assembly (L) ⑥⑦⑧
⑨. aft



4. ADJUSTMENT

- (1) Be sure to carry out this adjustment with the printer mechanism mounted on the lower cover.
- (2) Be sure to carry out this adjustment operation on a level and highly rigid worktable (flatness: less than 0.039 inch or 1 mm) so as to minimize adjustment error.

4.1 Printhead

- (1) Adjusting position

Perform adjustment at the three positions of left, center and right ends of the platen.

- (2) Adjustment value

① = 0.015 ± 0.002 inch (0.37 ± 0.05 mm)

- (3) Preparation for adjustment

Set the adjusting lever to range 1.

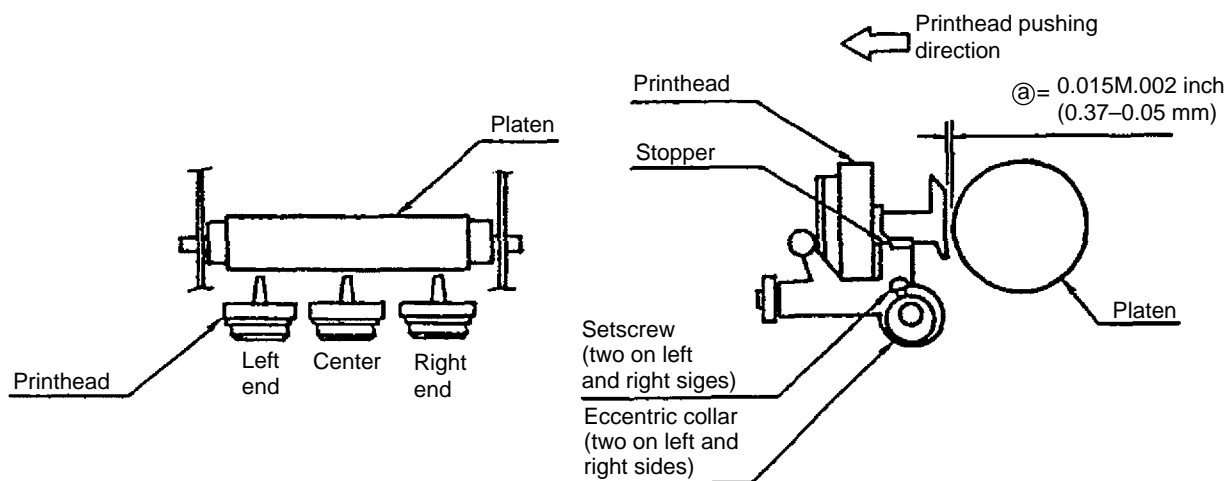
- (b) Set the release lever to the cut sheet position.
- (c) Remove the ribbon protector before adjustment.

- (4) Adjusting procedure

To adjust the gap, loosen the left and right eccentric collar setscrews, and rotate collar until the correct gap is obtained.

Note: 1. Make sure that the printhead is fitted correctly to the stopper.

2. When adjust the gap, must use thickness (feeler) gauge.



4.2 Adjustment of Gap between Ribbon Protector and Platen

4.2.1 Adjustment of Gap between Ribbon Protector and Platen (Monochrome Model)

(1) Adjustment value

- Ⓐ = More than 0.0055 inch (More than 0.14 mm)
- Ⓑ = More than 0.0031 inch (More than 0.08 mm)
- Ⓒ = 0 ± 0.006 inch (0 ± 0.15 mm) (In the direction of left and right)

(2) Preparation for adjustment

- (a) Set the adjusting lever to range 1 position.
- (b) Set the release lever to the cut sheet position.

(3) Adjustment procedure

Install the ribbon protector assembly, and adjust this assembly so that clearances Ⓐ, Ⓑ, between the ribbon protector film and the printhead can more than 0.0055 inch (0.14 mm), and the ribbon protector film and the platen can more than 0.0031 inch (0.08 mm) individually.

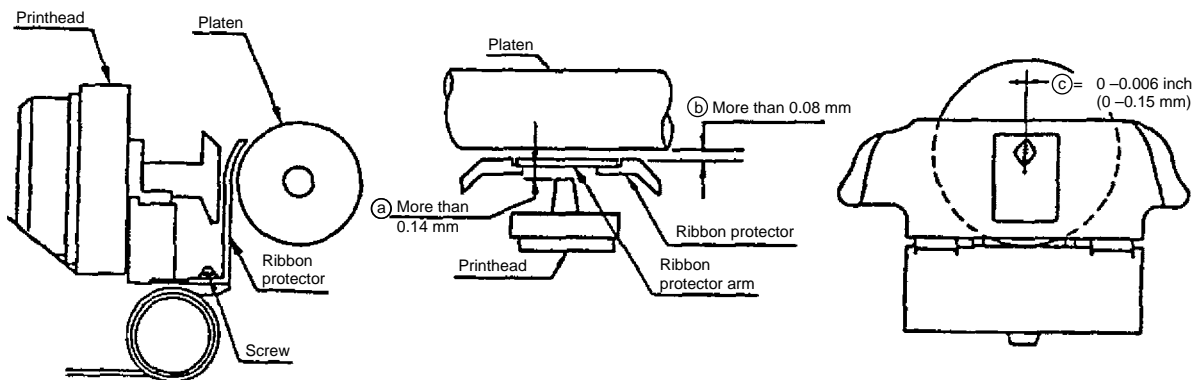
Note: 1. To adjust the assembly set the adjust fever to range 1.

- 2. Install the ribbon protector inserting 0.004 inch (0.1mm) Mylar film between the protector and the platen.
- 3. Check the clearance Ⓐ for more than 0.0055 inch (0.14mm), by inserting stacked' 0.006 inch (0.15mm) Mylar film gauge.

'Stacked with 0.004 inch (0.1mm) and 0.002 inch (0.05mm) Mylar film.

- 4. Check the clearance Ⓑ for more than 0.0031 inch (0.08mm), by inserting gauge of 0.004 inch (0.10mm) Mylar film gauge smoothly.

Adjust the printhead and the ribbon protector so that their centers are set at the same position (Ⓒ = 0 ± 0.006 inch or 0 ± 0.15 mm) and perform a visual check.



4.2.2 Adjustment of Gap between Ribbon Protector and Platen (Color Model)

(1) Adjustment value

- Ⓐ = More than 0.0063 inch (More than 0.16 mm)
- Ⓑ = More than 0.003 inch (More than 0.08 mm)
- Ⓒ = 0 M.006 inch (0 ± 0.15 mm).... (In the direction of left and right)

(2) Preparation for adjustment

- (a) Set the adjusting lever to range 1 position.
- (b) Set the release lever to the cut sheet position.

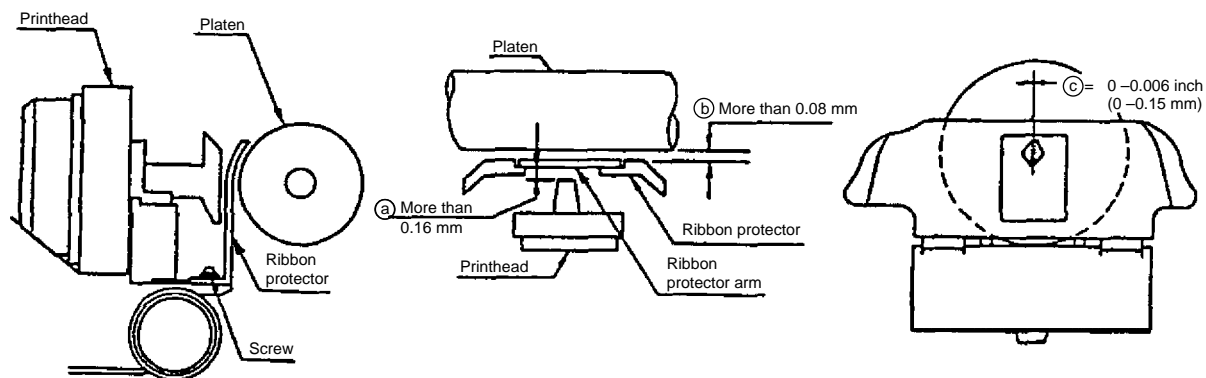
(3) Adjustment procedure

Install the ribbon protector assembly, and adjust this assembly so that clearances Ⓐ, Ⓑ between the ribbon protector film and the printhead can be more than 0.0063 inch (0.16 mm), and the ribbon protector film and the platen can be more than 0.003 inch (0.08 mm) individually.

Note: 1. To adjust the assembly set the adjust lever to rangr 1.

- 2. Install the ribbon protector inserting 0.004 inch (0.1mm) Mylar film between the protector and the platen.
- 3. Check the clearance Ⓐ for more than 0.0063 inch (0.16mm), by inserting stacked' 0.006 inch (0.15mm) Mylar film gauge.
'Stacked with 0.002 inch (0.05mm) mylar film.
- 4. Check the clearance Ⓑ for more than 0.0031 inch (0.08mm). by inserting gauge of 0.004 inch (0.10mm) Mylar film gauge smoothly.

Adjust the printhead and the ribbon protector so that their centers are set at the same position (Ⓒ = 0 ± 0.006 inch or 0 ± 0.15 mm) and perform a visual check.



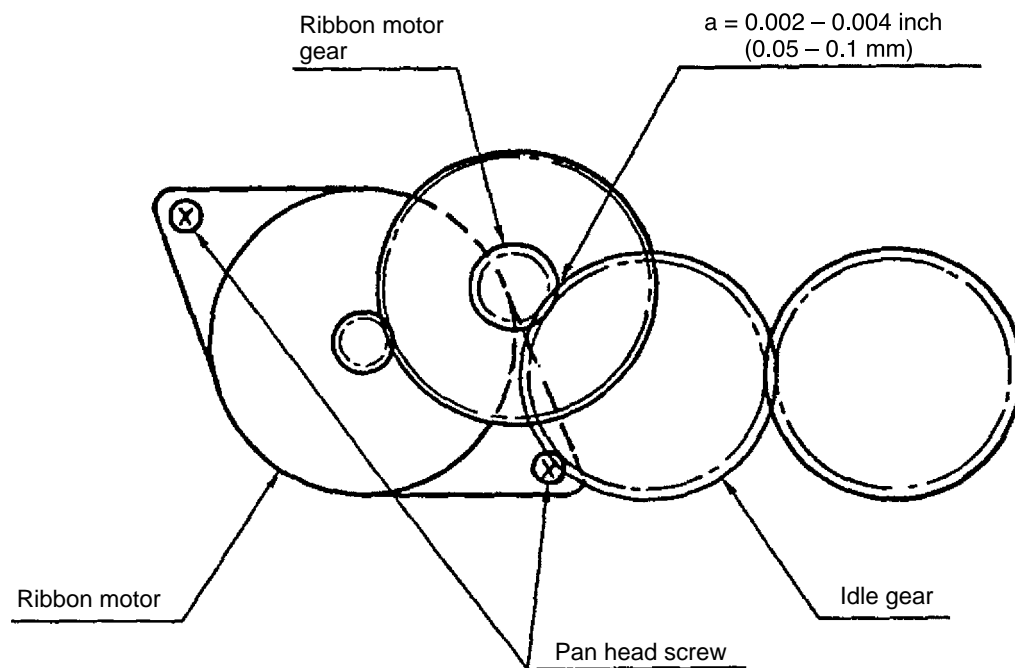
4.3 Ribbon Motor Gear Backlash

(1) Adjustment

$a = 0.002$ to 0.004 inch (0.05 to 0.1 mm)

(2) Adjusting procedure

Loosen the two pan head screws securing the ribbon motor, and adjust the backlash between the ribbon motor gear and idle gear.



4.4 Ribbon Drive Bevel Gear Backlash

(1) Adjustment value

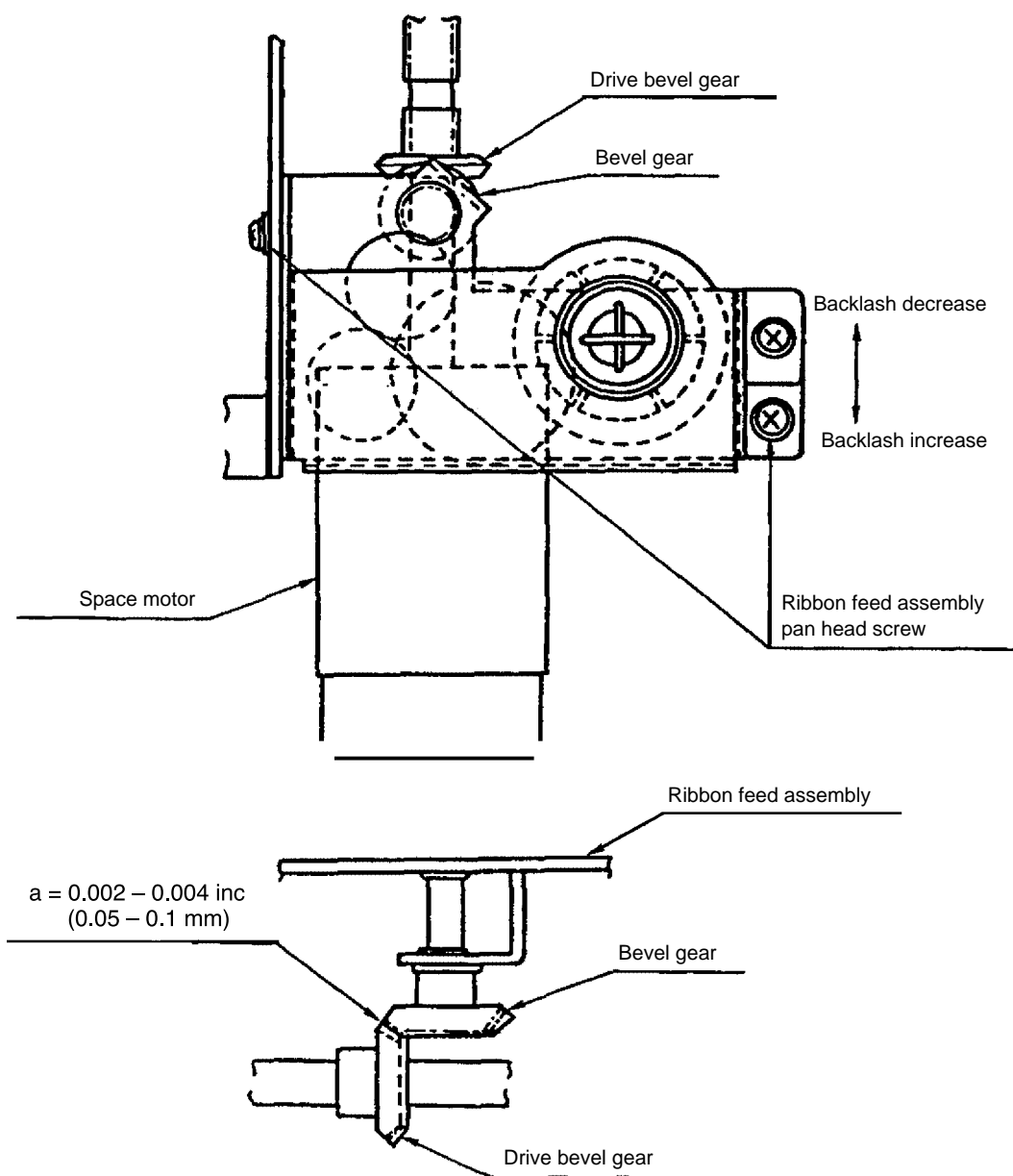
$a = 0.002$ to 0.004 inch (0.05 to 0.1 mm)

(2) Adjusting procedure

Loosen the two pan head screws securing the ribbon feed assembly, and move the ribbon feed assembly back and forth to adjust the gear backlash.

If moved forth, the backlash decreases.

If moved backward, the backlash increases.



4.5 Line Feed Belt Tension

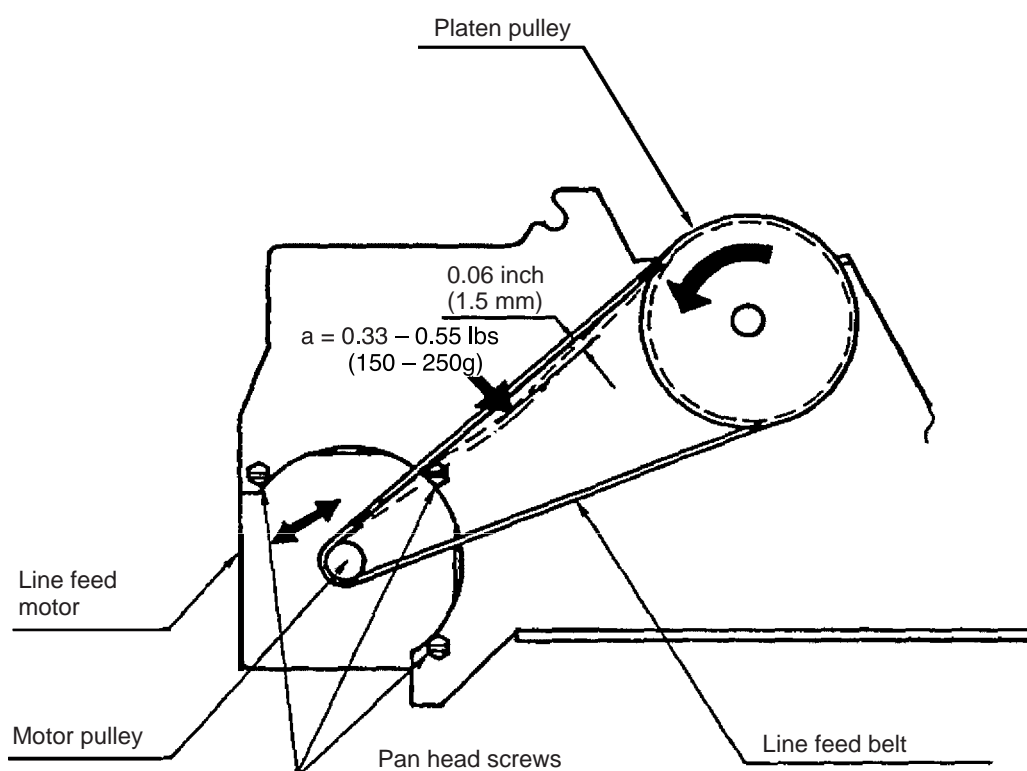
(1) Adjustment value

$a = 0.33 \text{ to } 0.55 \text{ lbs (150 to 250 g)}$

(2) Adjusting procedure

Adjust the line feed motor position so that the specified belt tension is obtained when the belt is depressed 0.06 inch (1.5 mm) in the middle of the span between the platen pulley and motor pulley.

Note: Revolve the platen pulley at least once before adjustment.



4.6 Adjustment with Color Model

Adjust the ribbon guide height and the gap between the shift cam lever and the color shift sensor by the procedure in the following:

(1) Position for adjustment

Perform adjustment for the left end, the center and the right end of the carriage assembly

(2) Adjustment value

$$a = 0 \pm 0.01 \text{ inch } (0 \pm 0.3 \text{ mm})$$

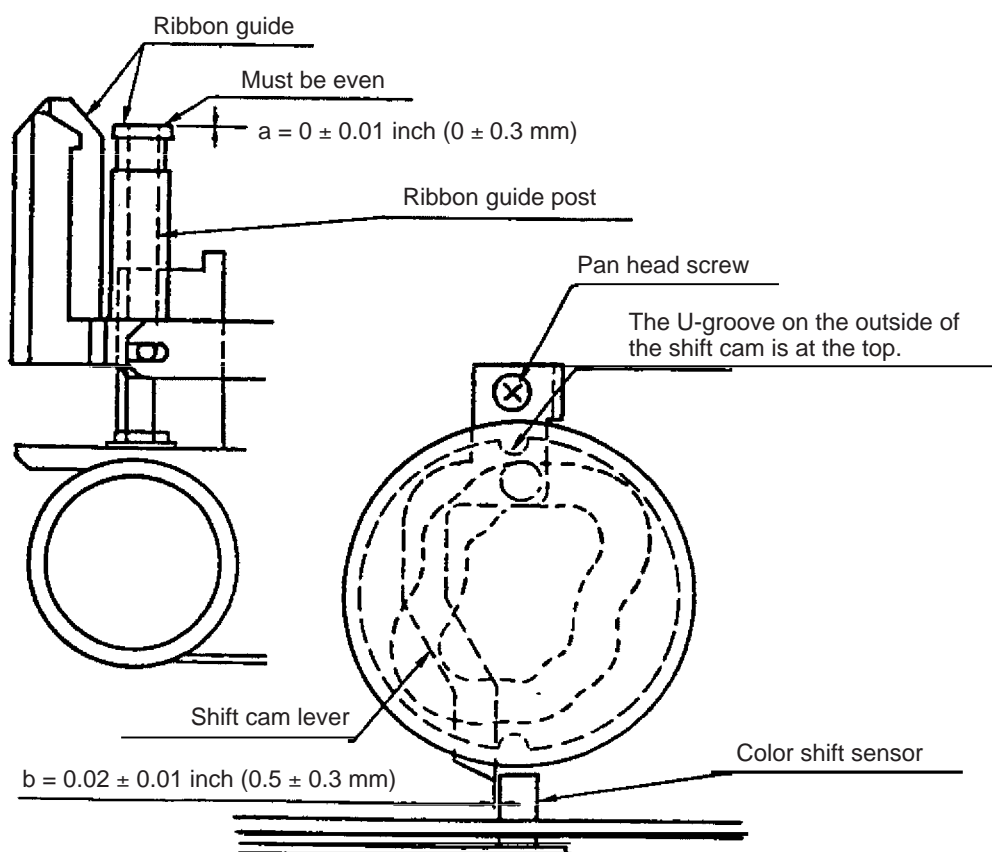
$$B = 0.02 \pm 0.01 \text{ inch } (0.5 \pm 0.3 \text{ mm})$$

(3) Adjustment procedure

When the U-groove on the outside of the shift cam is at the top;

1. The top of the ribbon guide post must be even with the top of the ribbon guide.
2. The gap between the color shift sensor end face and the shift cam lever must be within $0.02 \pm 0.01 \text{ inch } (0.5 \pm 0.3 \text{ mm})$.

Loosen the pan head screw to perform these adjustments.



4.7 Line Feed Belt Tension (Bottom Push Tractor Unit) (Option)

(1) Adjustment value

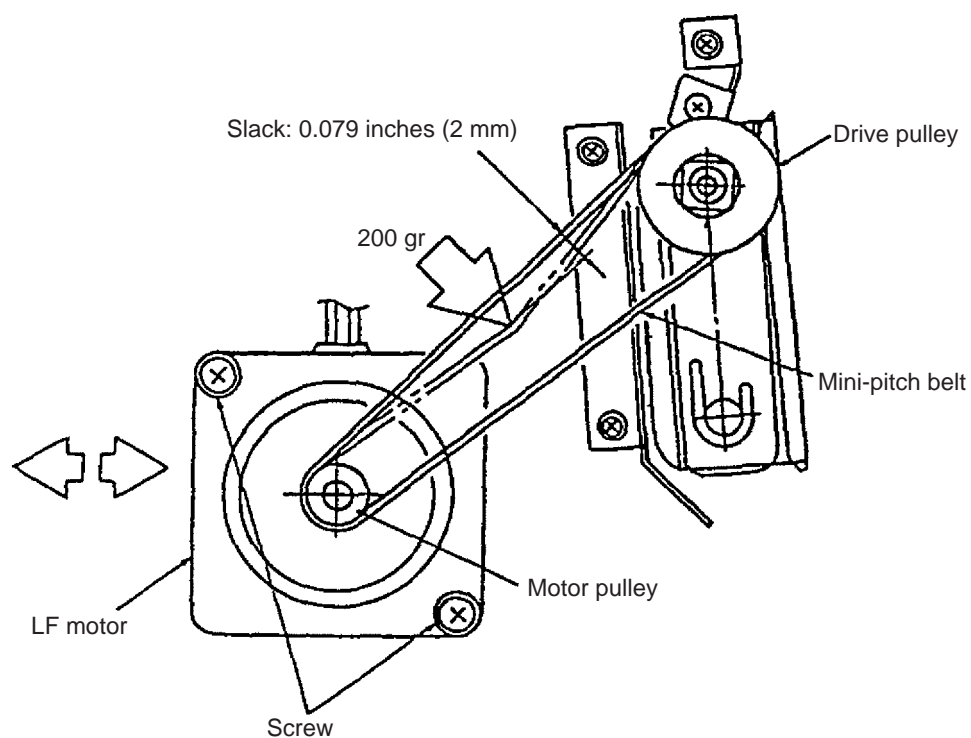
The slack of the belt should be 0.079 inches (2 mm) when a force equivalent to 200 g is applied to the middle of the belt.

(2) Adjusting procedure

Check belt at the center of the belt between the motor pulley and the drive pulley.

Method of adjustment:

Loosen the two screws that secure the LF motor and move the position of the motor.



5. CLEANING AND LUBRICATION

5.1 CLEANING

[Cautions]

1. Be sure to turn OFF the AC POWER switch before cleaning.
2. Do not allow dust to get inside the mechanism unit when cleaning.
3. If a lubricated part has been cleaned, be sure to apply lubricating oil to that portion after cleaning.

(1) Cleaning time

When the equipment operating time has reached six months or 300 hours, whichever comes first.

(2) Cleaning tools

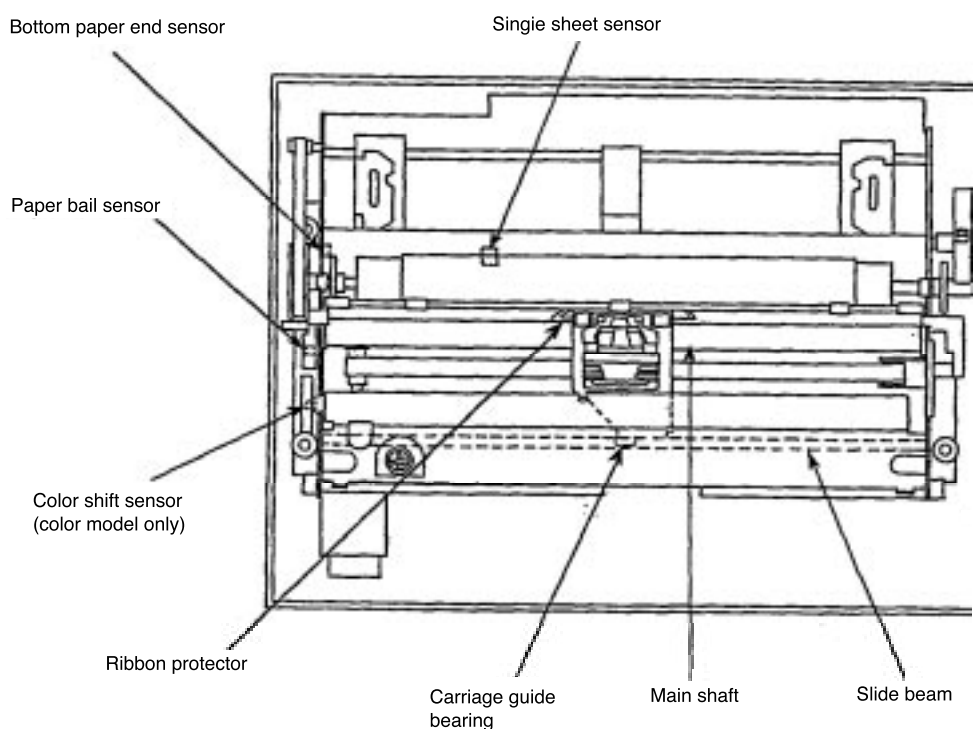
Dry cloth (soft cloth such as gauze), brush, cotton swab, vacuum cleaner

(3) Places to be cleaned

Table 5-1 lists the places to be cleaned:

Table 5-1

Place to be cleaned	Cleaning procedure
Main shaft and surrounding portion Top surface of slide beam From runner portion Ribbon protector and surrounding portion	Remove paper dust. and wipe off dirt, dust, and ribbon dust.
Single sheet sensor Paper bail sensor Bottom paper end sensor Color shift sensor (Color model)	Wipe off dirt from sensor. Wipe off dirt in the sensor window with a brush.
Carriage guide bearing	Wipe off dirt and dust.



5.2 LUBRICATION

(1) Lubrication time

When the operating hours have reached one year or 600 hours.

(2) Lubricant

- Pan motor oil 10W-30 (or equivalent): PM
- Alvania grease #2EP (or equivalent): GEP

(3) Amount of lubricant

- Large amount ① : Apply abundantly.
- Medium amount ② : Apply three to four drops of oil, or 0.008 inch (0.2mm) thick grease.
- Small amount ③ : Apply one drop of oil.

(4) Lubrication inhibit points

(a) Monochrome model

No.	Inhibit point	Reason	Remarks
1	Ink ribbon	To prevent blurring of print image	
2	Sensors	To prevent dust attachment	
3	Platen assembly (rubber face)	To prevent stained paper	
4	Sheet feeder assembly	To prevent stained paper	
5	Mini-pitch belt	To prevent deterioration and elongation of rubber	
6	Mini-pitch belt pulley tooth face	To prevent deterioration and elongation of rubber	
7	Head cable assembly	To prevent cable break	
8	Printhead	To prevent malfunction of print head	

(b) Color model

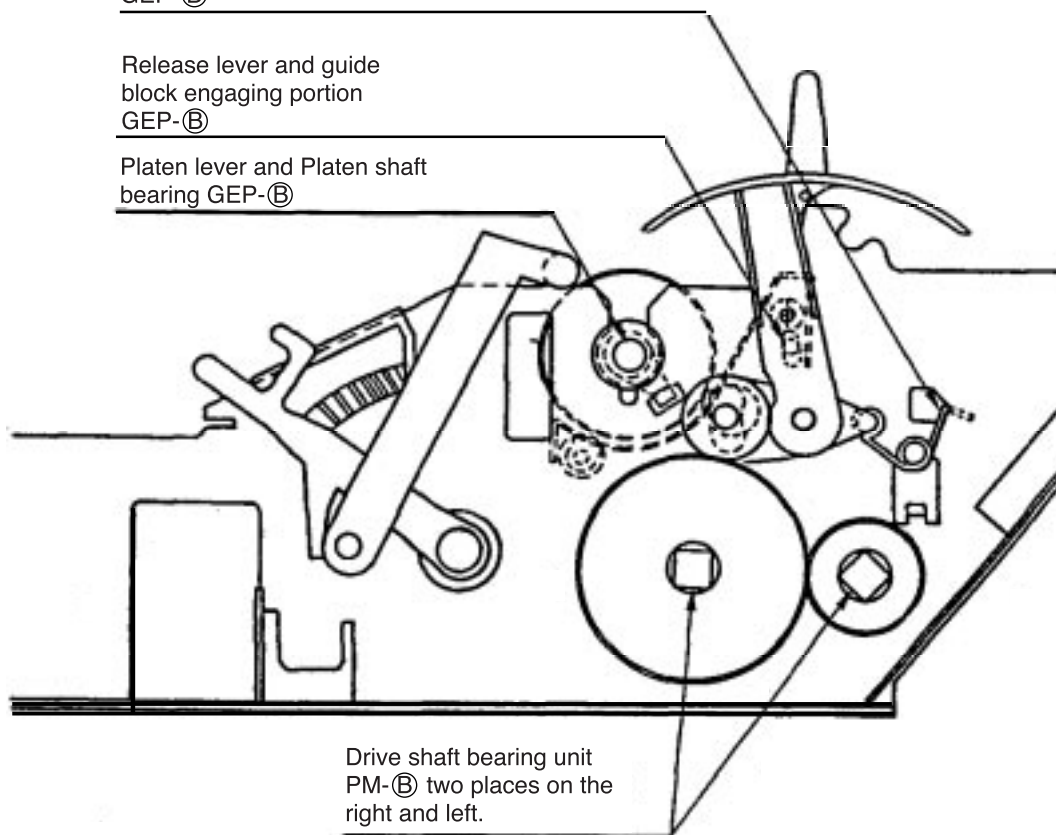
No.	Inhibit point	Reason	Remarks
1	Around ribbon shift cam	To prevent deterioration of break force	
2	All inhibit points listed for monochrome model	Listed above	

(5) Lubrication points

Detent spring and side
frame engaging portion
GEP-Ⓑ

Release lever and guide
block engaging portion
GEP-Ⓑ

Platen lever and Platen shaft
bearing GEP-Ⓑ



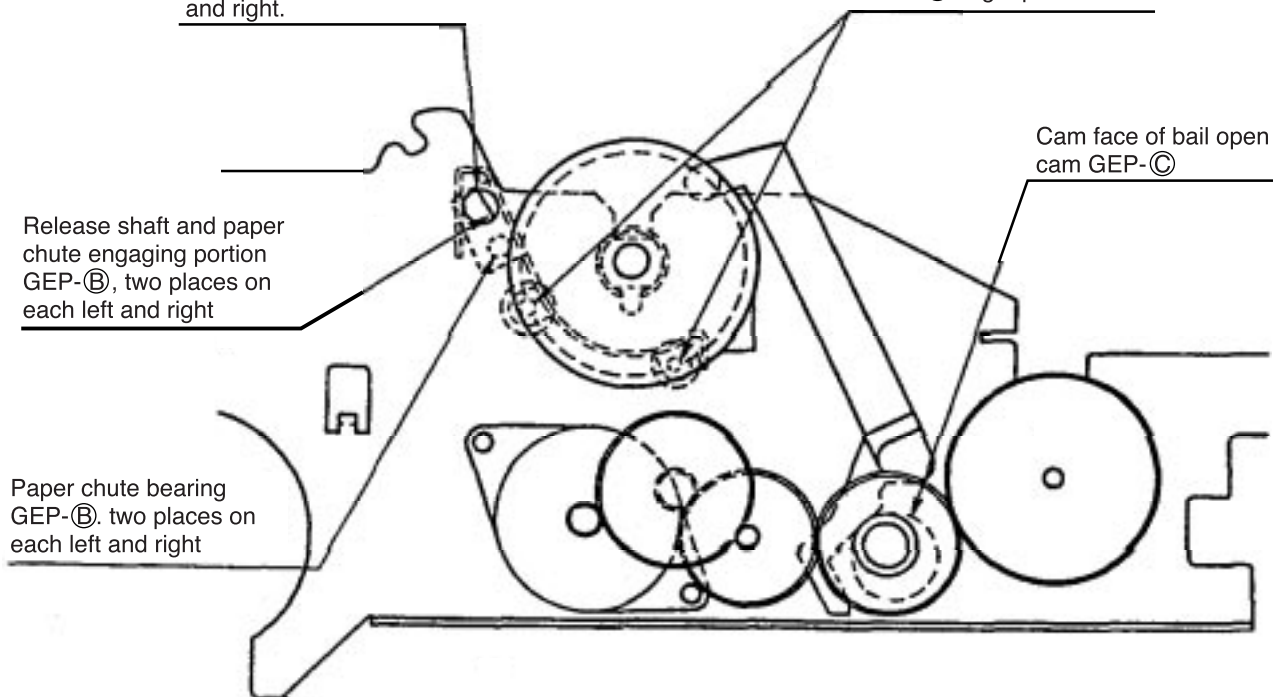
Release shaft and side
frame bearing GEP-Ⓑ,
two places on each left
and right.

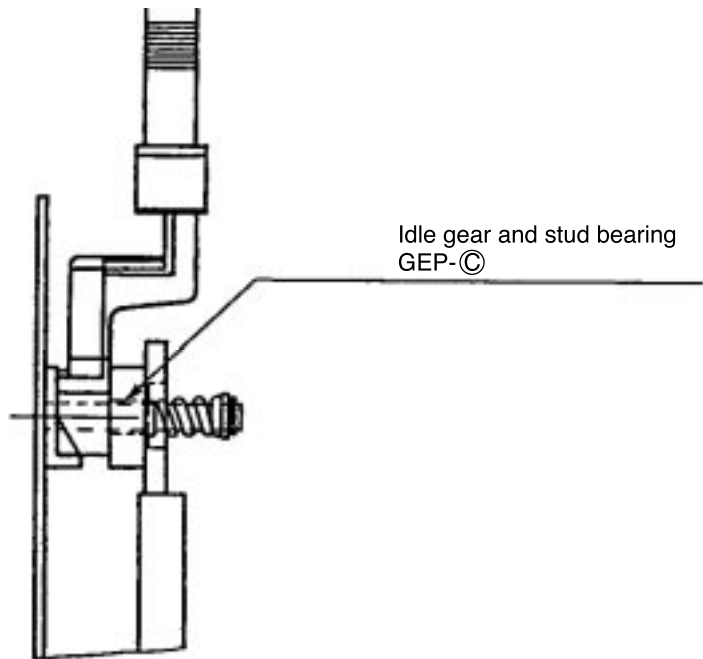
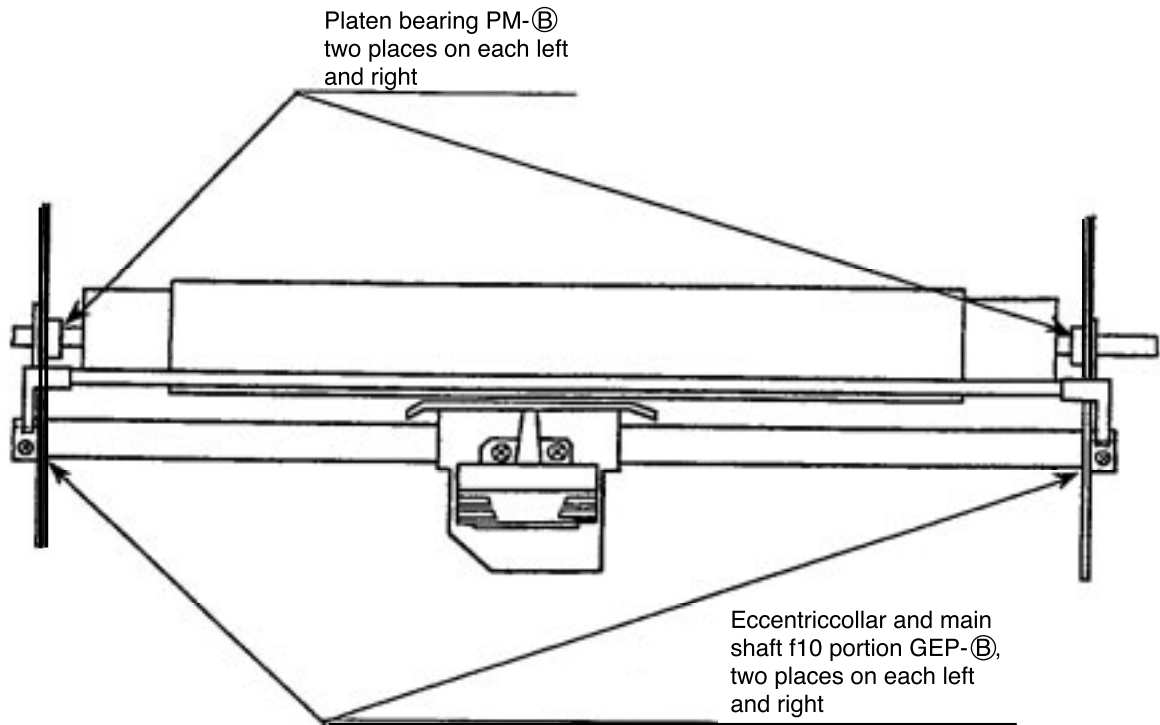
Pressure roller bearing
PM-Ⓒ. eight places

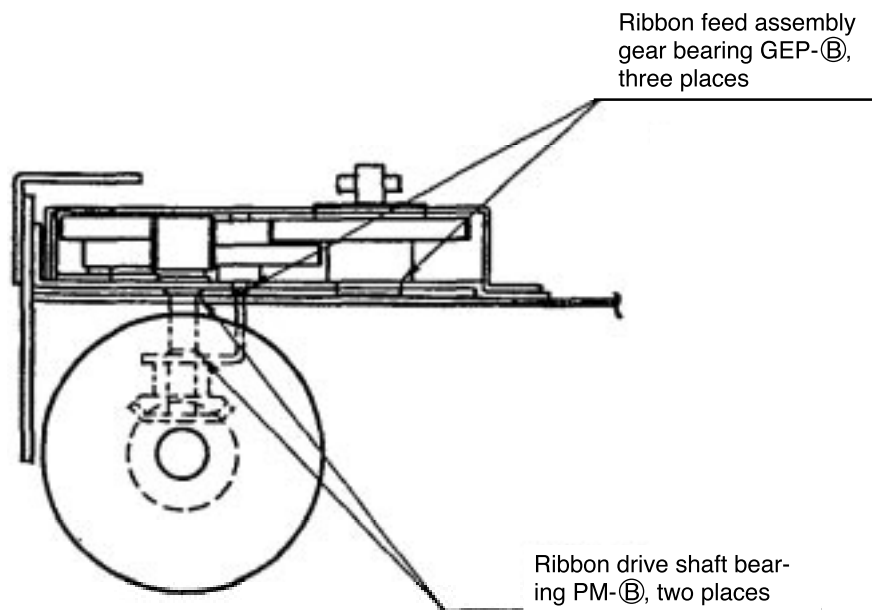
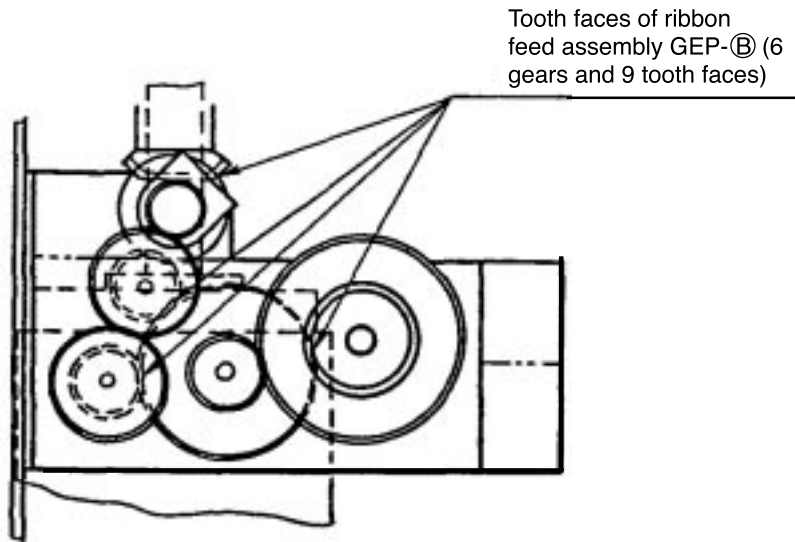
Release shaft and paper
chute engaging portion
GEP-Ⓑ, two places on
each left and right

Cam face of bail open
cam GEP-Ⓒ

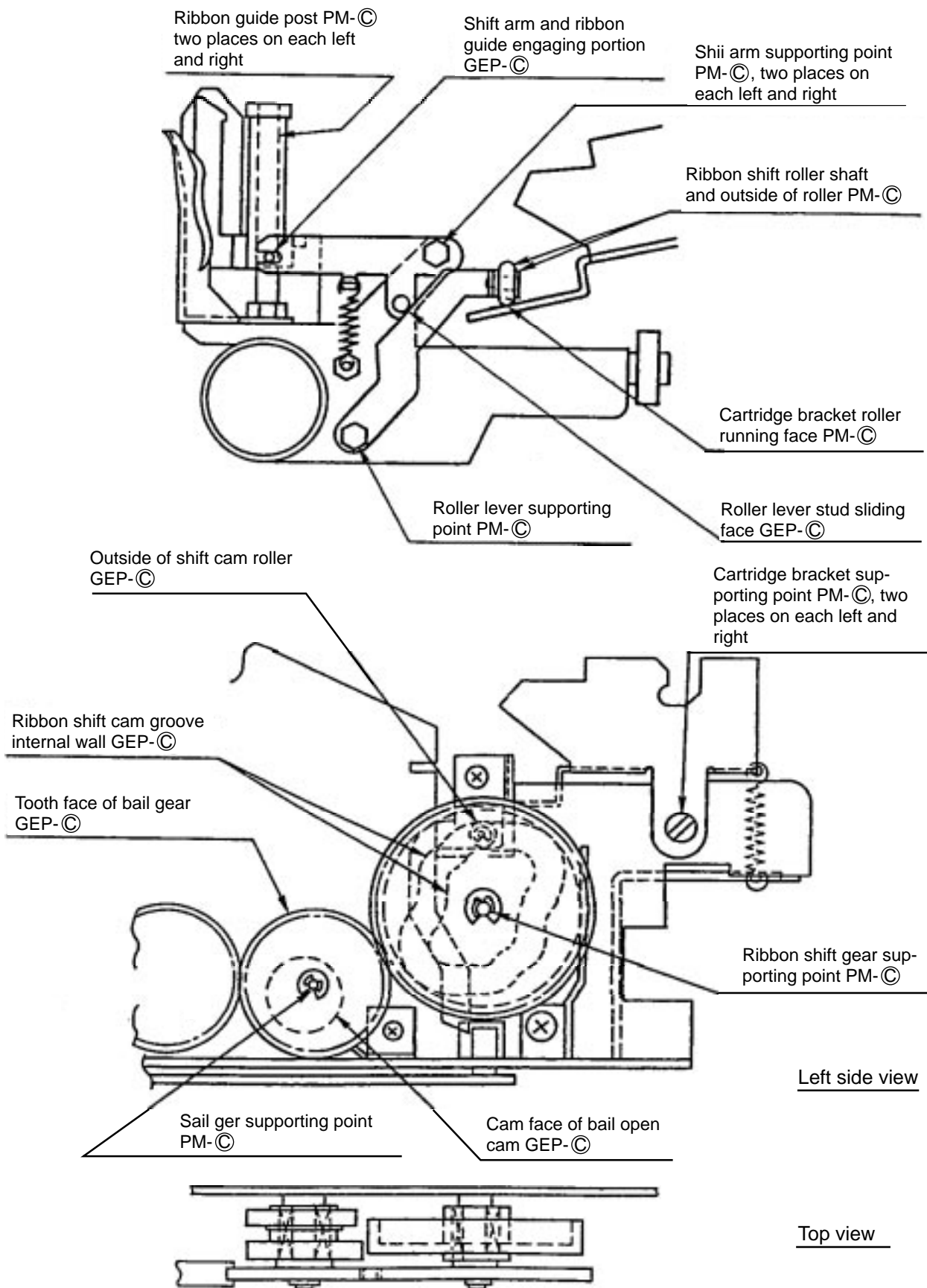
Paper chute bearing
GEP-Ⓑ. two places on
each left and right



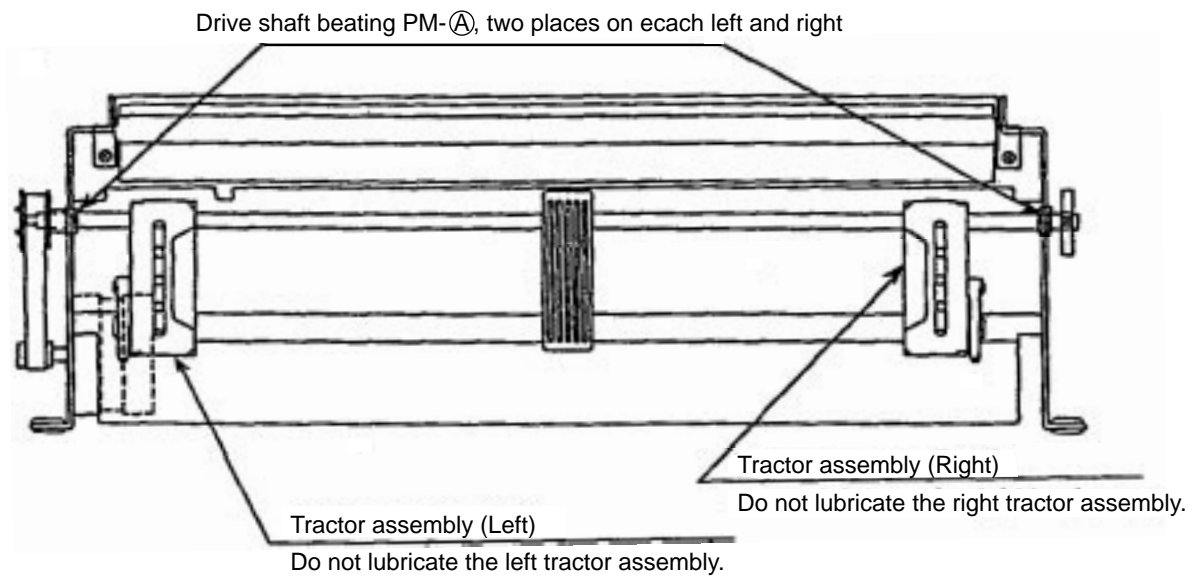




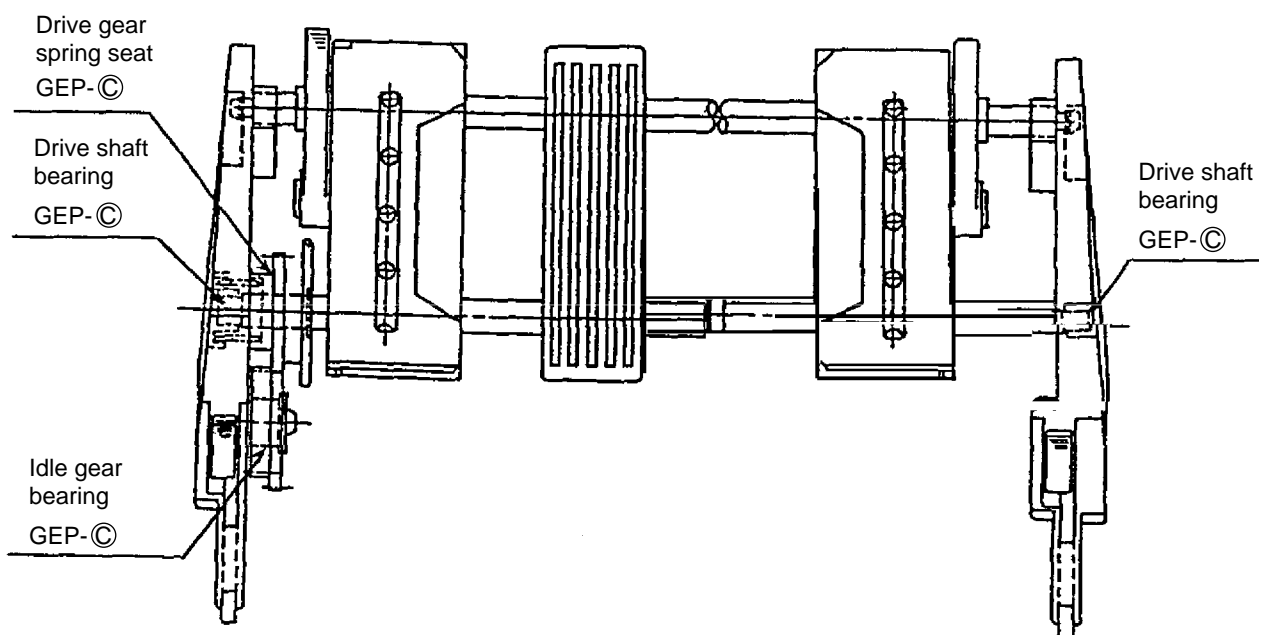
(6) Lubrication points of color model



(7) Lubrication points of bottom push tractor unit (option)



(8) Lubrication points of pull tractor unit (option)



6. TROUBLESHOOTING PROCEDURE

6.1 Cautions before Starting Repair Work

- (1) Check the inspection items specified in the instruction manual.
- (2) Find out as many details of the trouble as possible from the customer.
- (3) Inspect in the conditions as close as possible to those at the time the trouble occurred.
- (4) Proceed with the repair as follows:
 Check the trouble status according to Table 6-1 for the details of the trouble. Then, locate the trouble position according to the detailed flowchart.
- (5) Read the cautions given in Section 6.1 before starting the repair work.
- (6) Carry out a thorough test after the repair to check for correct functioning.

6.2 Troubleshooting Table

Table 6-1

Status	Details	Flowchart item No.
Trouble upon power on	• Power is not supplied.	①
	• No spacing operation. (Alarm lamp blinking)	②
	• Homing does not end normally.	③
Trouble during printing	• Wrong character, character omission or dot omission	④
	• Ribbon feed trouble	⑤
	• Line feed trouble	⑥
	• Malfunction of switch on operation panel	⑦
	• Data receiving failure	⑧
	• Trouble with change of color ribbon (color model)	⑨

6.3 Lamp Display

(1) Printer mode display

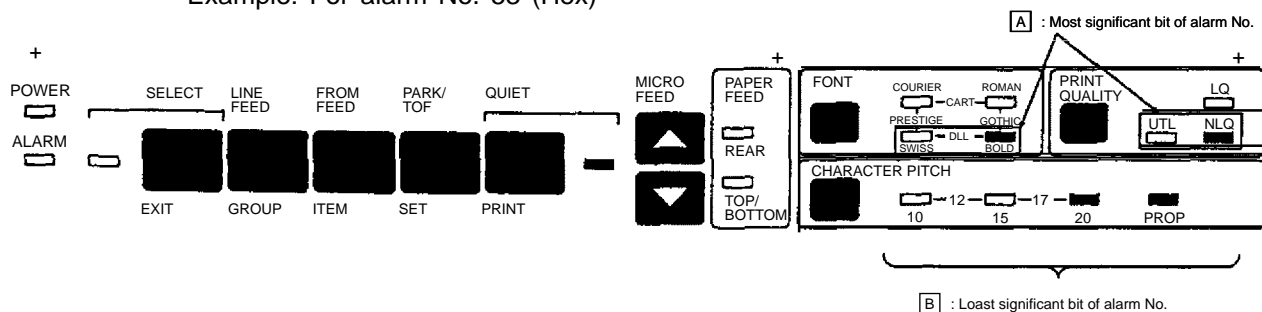
Table 6-2

Printer mode		ALARM	SELECT	Contents	Remarks
Operation mode	ON LINE	OFF	ON	Indicates that the printer is ready for raceiving.	
	HEX DUMP			Indicates that the printer is in the hex dump mode.	
	LOCAL	OFF	OFF	Indicates that the printer is in the local mode.	
	MENU			Indicates that the printer is in the menu mode.	
Operator alarm	Paper end	ON	OFF	Form end, single sheet end, or bottom paper end	
	Paper jam			SASF paper jam or double paper setting	
	CSF paper jam			Paper jam or paper end when CSF is installed	
	Cover open	ON	OFF	Indicates that the cover is open.	
	Print suppress	OFF	BLINK	Indicates that the printer is in the print suppress mode.	
	Head Tempera- ture	ON	ON	After cool down, continues to print.	
Fault alarm		BLINK	ON	For details see paragraph (2) fault alarm display.	

(2) Fault alarm display

When the printer detects any of the various alarm states, the information is displayed as shown below on the operation panel.

Example: For alarm No. 53 (Hex)



Note: For ODA, "BOLD" of "FONT" is displayed as "ORATOR" in the operation panel sheet.

Figure 6-1

Table 6-3

Attention: The table below, if the non SKC control board.

No	Error category	Alarm No. (Hex.)	LED indication	Remedy
1	Master CPU Internal RAM error	11	SWISS <input type="checkbox"/> BOLD <input type="checkbox"/> UTL <input type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input type="checkbox"/> 20 CPI <input type="checkbox"/> PROP <input checked="" type="checkbox"/>	Replace Control board.
2	Master CPU Program ROM error	12	SWISS <input type="checkbox"/> BOLD <input type="checkbox"/> UTL <input type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input type="checkbox"/> 20 CPI <input checked="" type="checkbox"/> PROP <input type="checkbox"/>	Replace program ROM or Control board.
3	Resident CG error	13	SWISS <input type="checkbox"/> BOLD <input type="checkbox"/> UTL <input type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input type="checkbox"/> 20 CPI <input checked="" type="checkbox"/> PROP <input checked="" type="checkbox"/>	Replace Control board.
4	Option CG error	14	SWISS <input type="checkbox"/> BOLD <input type="checkbox"/> UTL <input type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input checked="" type="checkbox"/> 20 CPI <input type="checkbox"/> PROP <input type="checkbox"/>	Replace Font Cartridge or Control board.
5	EEPROM error	15	SWISS <input type="checkbox"/> BOLD <input type="checkbox"/> UTL <input type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input checked="" type="checkbox"/> 20 CPI <input type="checkbox"/> PROP <input checked="" type="checkbox"/>	Replace Control board.
6	Master CPU Watchdog timer error	16	SWISS <input type="checkbox"/> BOLD <input type="checkbox"/> UTL <input type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input checked="" type="checkbox"/> 20 CPI <input checked="" type="checkbox"/> PROP <input type="checkbox"/>	•Turn power off then ON. •Replace program ROM or Control board.
7	Slave CPU ROM/RAM error	21	SWISS <input type="checkbox"/> BOLD <input type="checkbox"/> UTL <input checked="" type="checkbox"/> NLQ <input type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input type="checkbox"/> 20 CPI <input type="checkbox"/> PROP <input checked="" type="checkbox"/>	Replace slave pro- gram ROM or Control board.
8	Slave CPU Watchdog timer error	24	SWISS <input type="checkbox"/> BOLD <input type="checkbox"/> UTL <input checked="" type="checkbox"/> NLQ <input type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input checked="" type="checkbox"/> 20 CPI <input type="checkbox"/> PROP <input type="checkbox"/>	•Turn power off then ON. •Replace slave program ROM or Control board.
9	Master CPU External RAM error	31	SWISS <input type="checkbox"/> BOLD <input type="checkbox"/> UTL <input checked="" type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input type="checkbox"/> 20 CPI <input type="checkbox"/> PROP <input checked="" type="checkbox"/>	Replace Control board.
10	Option RAM error	32	SWISS <input type="checkbox"/> BOLD <input type="checkbox"/> UTL <input checked="" type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input type="checkbox"/> 20 CPI <input checked="" type="checkbox"/> PROP <input type="checkbox"/>	Replace RAM cartridge or Control board.

Note 1 ☒ LED on ☐ LED off

Note 2 Other LEDs except POWER LED light off

Table 6-3**Attention:** The table below, if the non SKC control board.

No	Error category	Alarm No. (Hex.)	LED indication	Remedy
11	Printhead homing error	53	SWISS <input type="checkbox"/> BOLD <input checked="" type="checkbox"/> UTL <input type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input type="checkbox"/> 20 CPI <input checked="" type="checkbox"/> PROP <input checked="" type="checkbox"/>	Refer to flowchart No ③.
12	Slave CPU Initial error	54	SWISS <input type="checkbox"/> BOLD <input checked="" type="checkbox"/> UTL <input type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input checked="" type="checkbox"/> 20 CPI <input type="checkbox"/> PROP <input type="checkbox"/>	Replace Control board.
13	Thermistor open error	55	SWISS <input type="checkbox"/> BOLD <input checked="" type="checkbox"/> UTL <input type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input checked="" type="checkbox"/> 20 CPI <input type="checkbox"/> PROP <input checked="" type="checkbox"/>	Replace Printhead or Control board.
14	Ribbon error	57	SWISS <input type="checkbox"/> BOLD <input checked="" type="checkbox"/> UTL <input type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input checked="" type="checkbox"/> 20 CPI <input checked="" type="checkbox"/> PROP <input checked="" type="checkbox"/>	Refer to flowchart No ③.
15	EEPROM write error	59	SWISS <input type="checkbox"/> BOLD <input checked="" type="checkbox"/> UTL <input type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input checked="" type="checkbox"/> 15 CPI <input type="checkbox"/> 20 CPI <input type="checkbox"/> PROP <input checked="" type="checkbox"/>	Replace Control board.
16	Spacing error	5B	SWISS <input type="checkbox"/> BOLD <input checked="" type="checkbox"/> UTL <input type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input checked="" type="checkbox"/> 15 CPI <input type="checkbox"/> 20 CPI <input checked="" type="checkbox"/> PROP <input checked="" type="checkbox"/>	Refer to flowchart No ②, ③.
17	Bail arm error	5C	SWISS <input type="checkbox"/> BOLD <input checked="" type="checkbox"/> UTL <input type="checkbox"/> NLQ <input checked="" type="checkbox"/> 10 CPI <input checked="" type="checkbox"/> 15 CPI <input checked="" type="checkbox"/> 20 CPI <input type="checkbox"/> PROP <input type="checkbox"/>	Refer to flowchart No ③.
18	Fan alarm	60	SWISS <input type="checkbox"/> BOLD <input checked="" type="checkbox"/> UTL <input checked="" type="checkbox"/> NLQ <input type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input type="checkbox"/> 20 CPI <input type="checkbox"/> PROP <input type="checkbox"/>	Refer to flowchart No ③.
19	Bottom feeder connection error	61	SWISS <input type="checkbox"/> BOLD <input checked="" type="checkbox"/> UTL <input checked="" type="checkbox"/> NLQ <input type="checkbox"/> 10 CPI <input type="checkbox"/> 15 CPI <input type="checkbox"/> 20 CPI <input type="checkbox"/> PROP <input checked="" type="checkbox"/>	•Check model of bottom feeder. •Replace Control board -or BTFD-2 PCB.

Table 6-4

Attention: The table below, if the SKC control board.

No	Error category	Alarm No. (Hex.)	LED indication	Remedy
1	Internal RAM error	11	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace control board.
2	Program ROM error	12	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace control board.
3	CG error	13	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace control board.
4	Watchdog timer error	16	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace control board.
5	CPU error (prefetch abort)	17	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace control board.
6	CPU error (data abort)	18	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace control board.
7	LSI error (bus control)	19	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace control board.
8	LSI error (DMA transfer)	1A	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace control board.
9	CPU error (Undefined abort)	1B	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace control board.
10	Printhead homing error	53	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Refer to flowchart No. ③.
11	Head thermistor open error	55	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace Printhead or Control board.





Note 1  LED on  LED off
 Note 2 Other LEDs except POWER LED light off

Table 6-4

Attention: The table below, if the SKC control board.

No	Error category	Alarm No. (Hex.)	LED indication	Remedy
12	Head thermistor short error	56	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace Printhead or Control board.
13	Ribbon error	57	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Refer to flowchart No. ③.
14	Spacing error	5B	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Refer to flowchart No. ② or ③.
15	Bail arm error	5C	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Refer to flowchart No. ③.
16	Fan alarm	60	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Refer to flowchart No. ③.
17	Bottom feeder connection error	61	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	<ul style="list-style-type: none"> • Check model of bottom feeder. • Replace control board or BTFD-2 PCB.
18	Flash ROM error (toggle check)	71	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace control board.
19	Flash ROM error (signature check)	72	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace control board.
20	Flash ROM error (data write error)	73	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace control board.
21	Flash ROM error (sector erase error)	74	<div> <div>SWISS</div> <div>10 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>BOLD</div> <div>15 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>UTL</div> <div>20 CPI</div> <div> <div></div> <div></div> </div> </div> <div> <div>NLQ</div> <div>PROP</div> <div> <div></div> <div></div> </div> </div>	Replace control board.

Note 1  LED on  LED off
Note 2 Other LEDs except POWER LED light off

6.4 Parts Layout

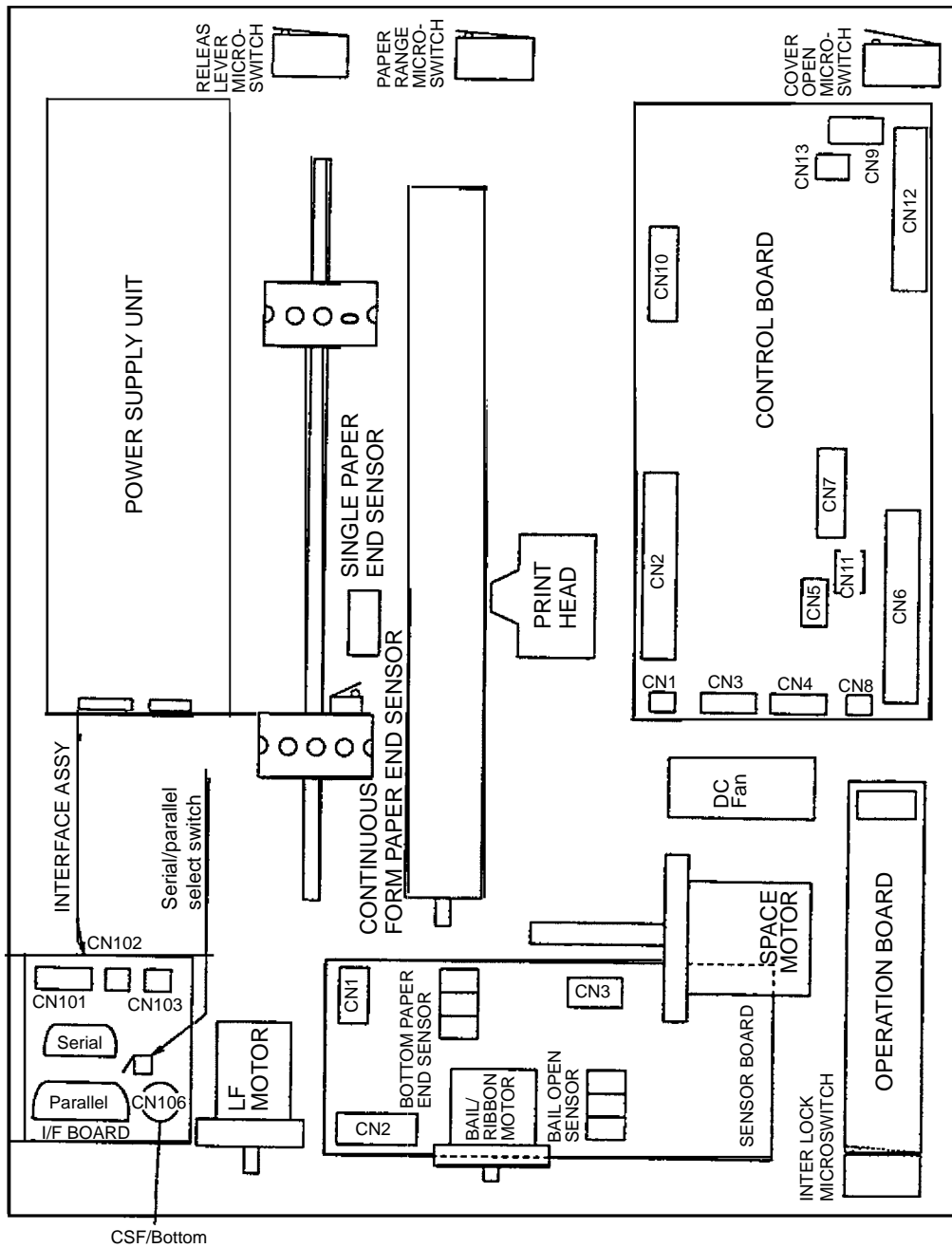
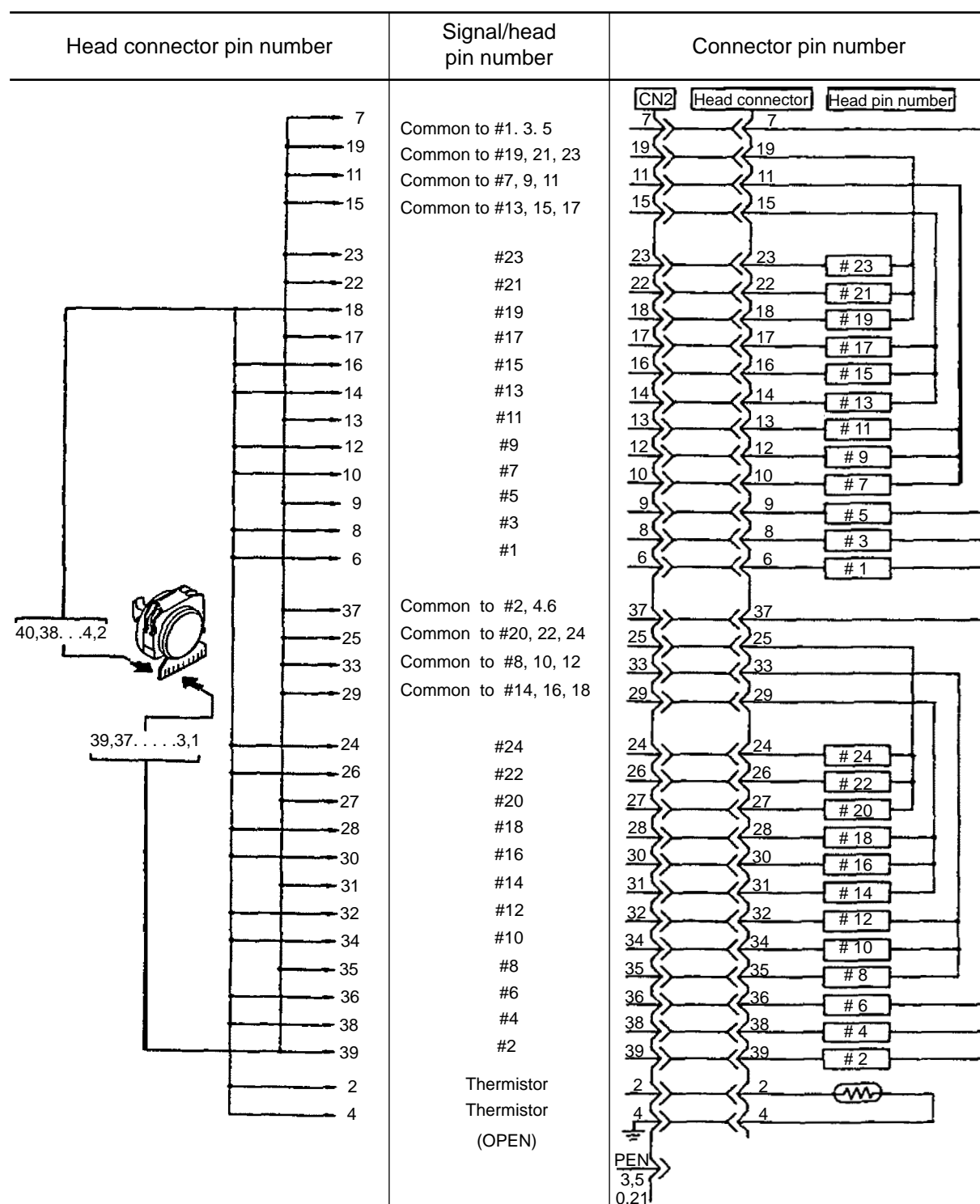


Figure 6-2

6.5 Connection Circuit and Resistance Check for Printhead and LF/SP/RBN Motor

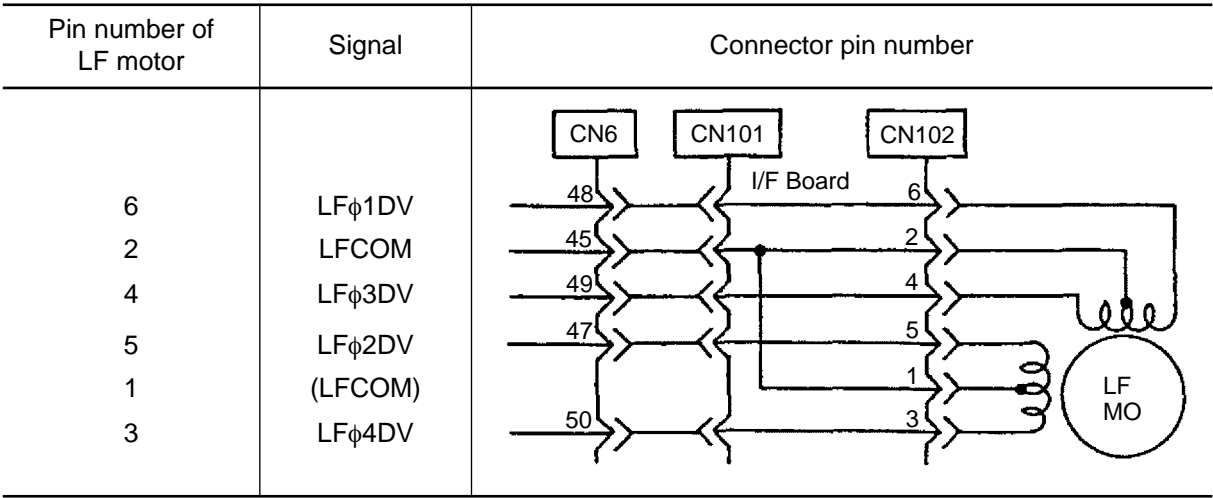
(1) Printhead

Resistance of each coil should be about 4.5Ω



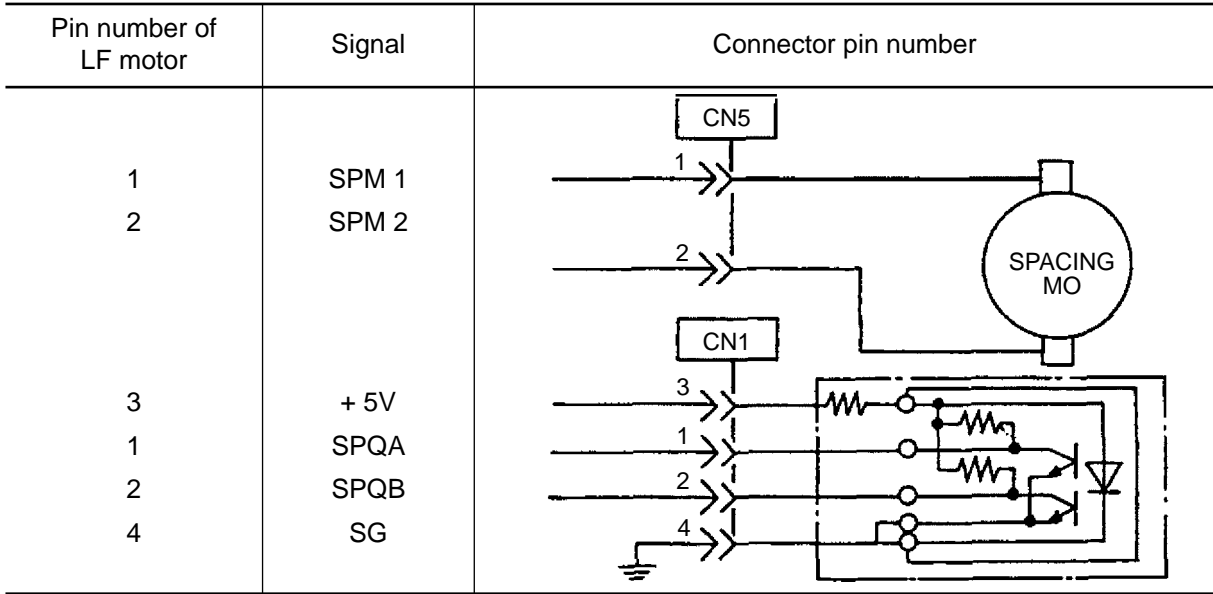
(2) Line feed motor

Resistance of each coil should be about 3.4Ω



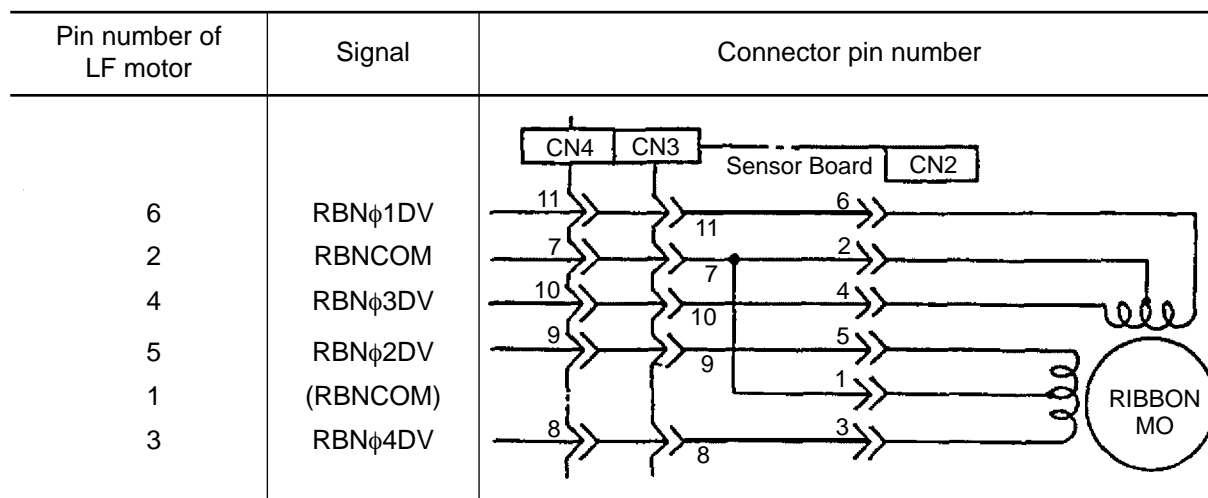
(3) Space motor

Resistance of motor should be about 11.4Ω



(4) Ribbon motor

Resistance of each coil should be about 34Ω



6.6 Troubleshooting Flow Chart

① Power is not supplied.

- Is the AC cable connected correctly?

YES

NO

- Connect the AC cable correctly.

- Is fuse F1 on the power supply unit blown?

NO

YES

- Replace fuse F1.(with same type and rated fuse.)

- Remedied?

NO

YES

- End

- Replace the power supply unit or connection cable. (See Section 3.3.20.)

- Are the +5V and +38V outputs in the control board provided?

+38V: Check between CN3-13pin and 2pin.

+5V: Check between CN7-5pin and 8pin.

YES

NO

- Are cables CN3 and CN7 on the control board connected correctly?(See figure below.)

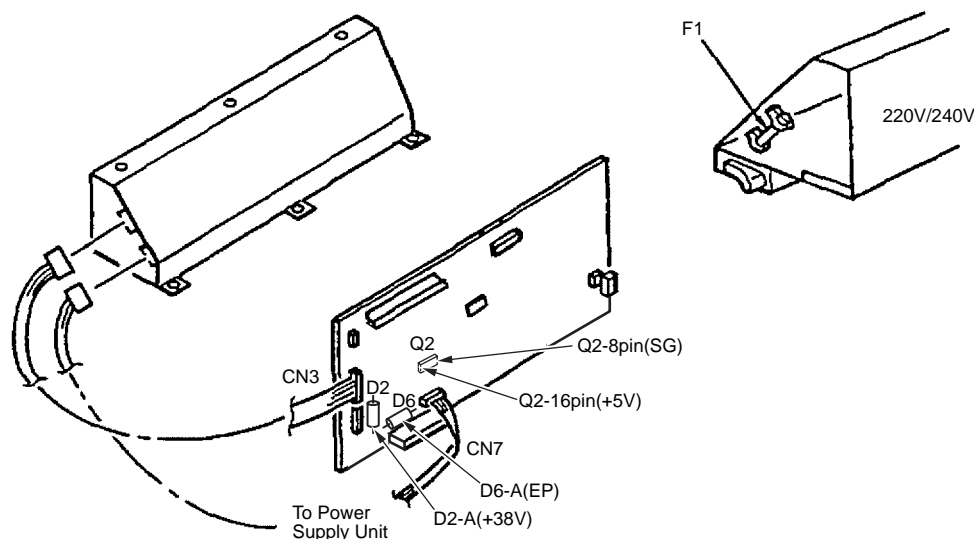
NO

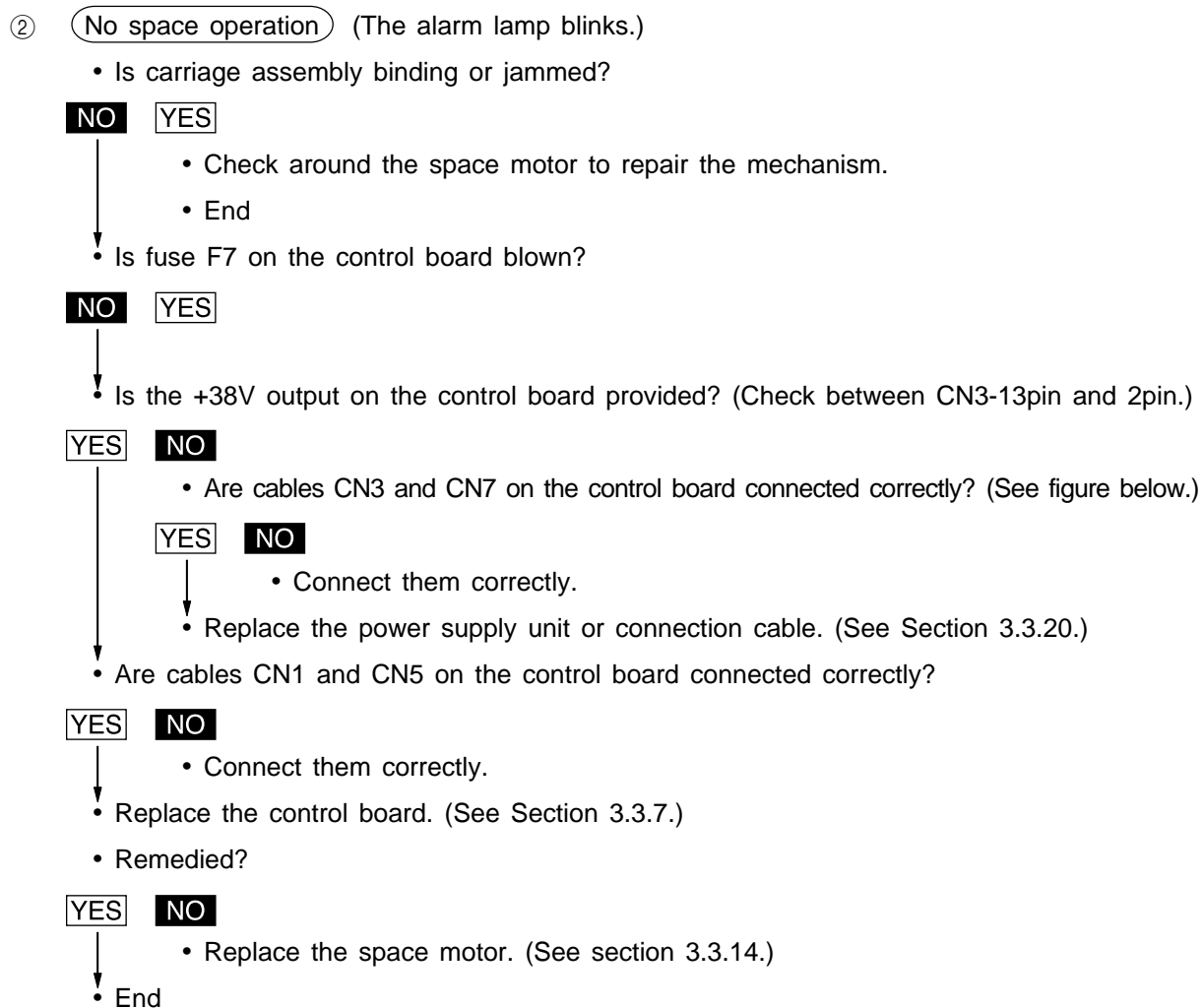
YES

- Replace the power supply unit or connection cable.
(See Section 3.3.20.)

- Connect them correctly.

- Replace the control board. (See Section 3.3.7.)





③ Homing does not end normally.

- Alarm 57 (ribbon error)?

NO **YES**

- To step 3-2

- Alarm 5C (bail alarm error)?

NO **YES**

- To step 3-4

- Alarm 60 (fan alarm error)?

NO **YES**

- Replace the power supply unit. (See Section 3.3.20.)

- Alarm 53 (printhead homing error)?

NO **YES**

- Is the +38V output on the control board proper? (See figure below.)

YES **NO**

- Are cables CN3 and CN7 on the control board correctly connected to the power supply unit? (See figure below.)

NO **YES**

- Replace the power supply unit.

(See Section 3.3.20.)

- Connect them correctly.

- Is cable CN1 on the control board connected correctly? (See figure below.)

YES **NO**

- Connect it correctly.

- ① • Replace the control board. (See Section 3.3.7.)

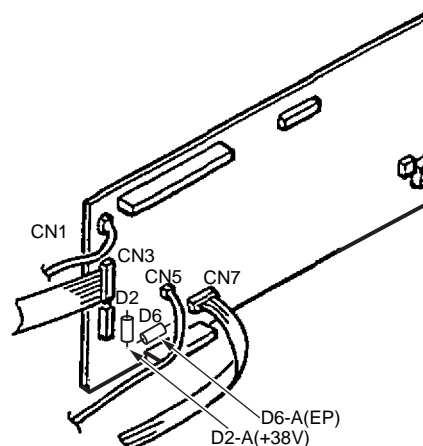
- Remedied?

NO **YES**

- End

- Replace the space motor. (See section 3.3.14.)

3-1



3-1

- Turn off the power and manually move the carriage. Does it move smoothly?

NO **YES**

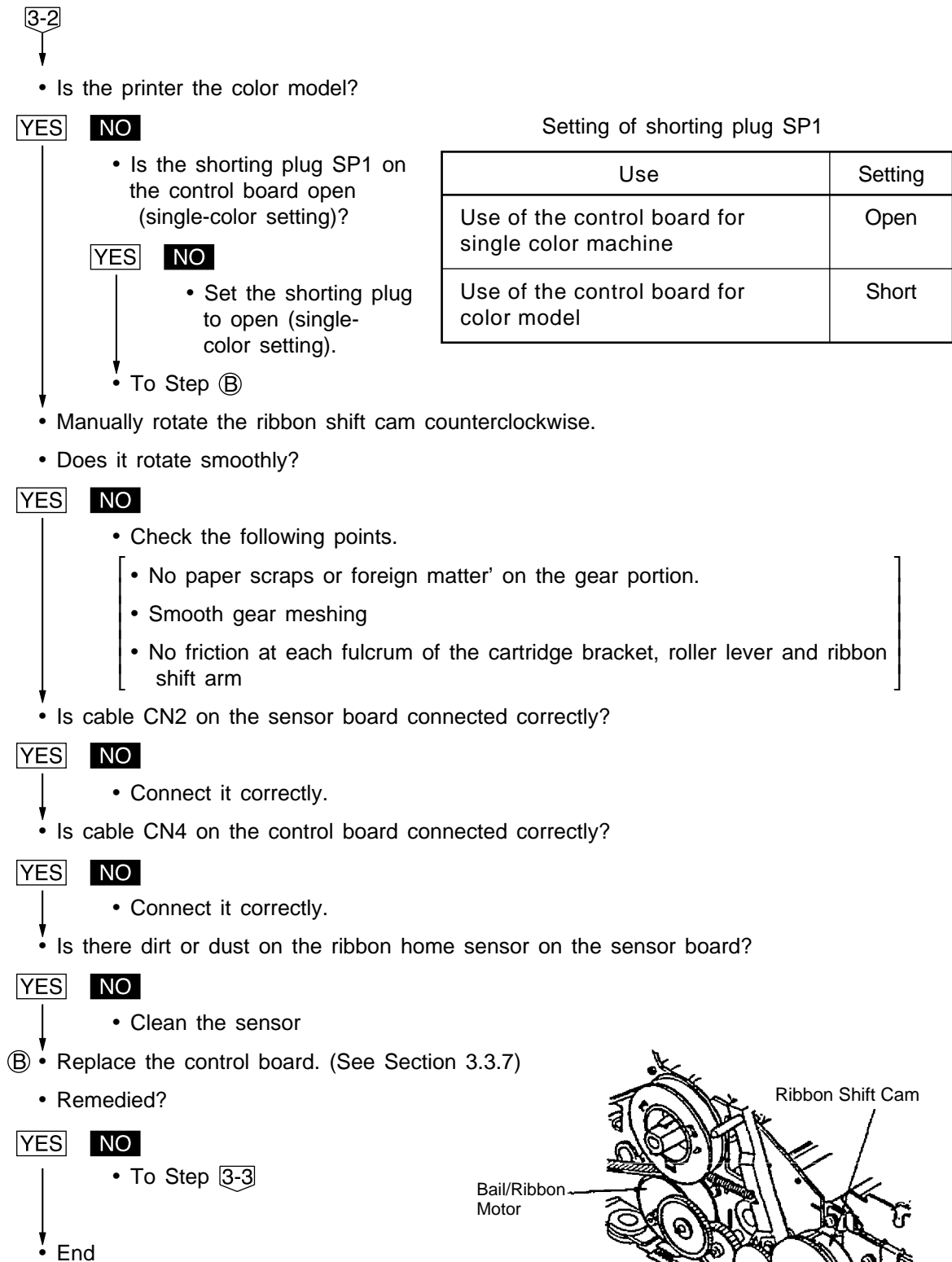
- To step ④
- Are there any paper scrap or dirt on the spacing mechanism?

NO **YES**

- Remove it.
- Remove the ribbon cartridge.
- Does the carriage move smoothly?

NO **YES**

- Replace the ribbon cartridge.
- Replace the ribbon feed assembly. (See Section 3.3.13.)



3-3

- Replace the bail/ribbon motor. (See Section 3.3.16.)
- Remedied?

YES**NO**

- Replace the sensor board. (See Section 3.3.12.)
- End

3-4

- Manually rotate the bail open gear counterclockwise.
- Does it rotate smoothly?

YES

NO

- Remove any paper scrap or foreign matter near the bail/ribbon motor gear, idle gear and bail open gear
- Check the meshing of each of the above. gears.
- Is cable CN4 on the control board connected correctly? (See figure below.)

YES

NO

- Connect it correctly
- Are cables CN2 and CN3 on the sensor board connected correctly? (See figure below.)

YES

NO

- Connect them correctly.
- Is there dirt or dust on any of the sensors on the sensor board?

NO

YES

- Clean the sensor.
- Is bail arm L damaged?

NO

YES

- Replace bail arm L.
- Replace the control board. (See Section 3.3.7.)
- Remedied?

YES

NO

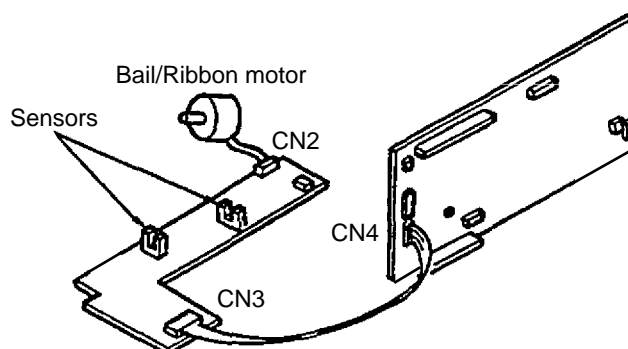
- Replace the sensor board. (See Section 3.3.12.)
- Remedied?

YES

NO

- Replace the bail/ribbon motor. (See Section 3.3.16.)
- End

• End



④ Wrong character, character omission or dot omission

- Are cables CN2 and CN6 on the control board connected correctly?

YES NO

- Connect them correctly.

- Is cable CN101 on the interface connector board connected correctly? (See figure below.)

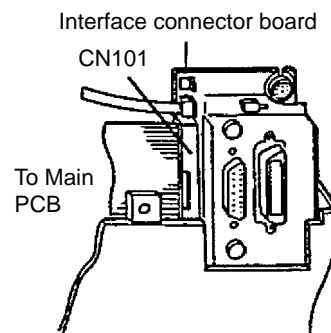
YES NO

- Connect it correctly.

- Is the interface cable connected correctly?

YES NO

- Connect it correctly.



- Are cables CN3 and CN7 on the control board connected correctly to the power supply unit?

YES NO

- Connect them correctly.

- Replace the power supply unit. (See Section 3.3.20.)

- Remedied?

YES NO

- Replace the Printhead.

- Remedied?

NO YES

- End

- Replace the control board.

(See Section 3.3.7.)

- Remedied?

NO YES

- End

- Do cables connected to CN2 and CN6 on the control board have internal open-circuit? (See figure below.)

NO YES

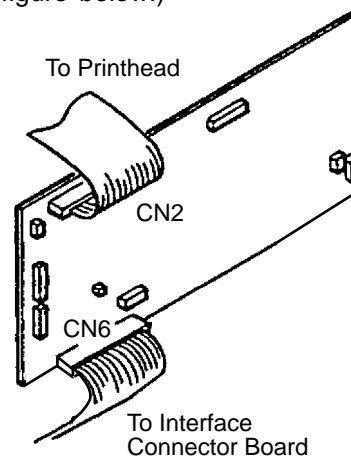
- Replace the cable(s).

- To Step 4-1

4-1

- Check the menu settings related to the interface.

- Baud rate
- Character format
- Protocol
- Busy signal output terminal selection



⑤ Ribbon feed trouble

- Remove ribbon cartridge and rotate the ribbon cartridge ribbon feed knob.
- Does it rotate smoothly?

YES

NO



- Check to see if ribbon lock mechanism has been disengaged.
- Replace the ribbon cartridge.
- Manually shift the carriage to the left and to the right.
- Does the ribbon feed shaft rotate?

YES

NO



- Replace the ribbon feed assembly (See Section 3.3.13.)
- After the replacement, it is necessary to adjust the backlash between the space motor gear and bevel gear. (See Section 4.4.)
- Check that the ribbon feed shaft is correctly engaged with the ribbon feed roller of the ribbon cartridge.

⑥ Line feed trouble

- Manually rotate the platen knob.
- Does it rotate smoothly?

YES

NO

- Set the release lever to the open side.
- Does the platen knob rotate smoothly?

NO

YES

- Correct paper setting
- Remove any foreign matter or dust on the platen gear, idle gear or drive gear
- Smooth meshing of platen gear, idle gear and drive gear
- Correct phasing of push tractor assembly (R) or (L). (See Section 3.3.18.)
- Replacement of push tractor assembly (R) or (L). (See Section 3.3.18.)
- Adjust the LF motor mini-pitch belt tension. (See Section 4.5)

- Is cable CN6 on the control board connected correctly?

YES

NO

- Connect it correctly.

- Is cable CN101 on the interface connector board connected correctly? (See figure below.)

YES

NO

- Connect it correctly.

- Is cable CN102 on the interface connector board connected correctly? (See figure below.)

YES

NO

- Connect it correctly.

- Replace the control board. (See Section 3.3.7.)

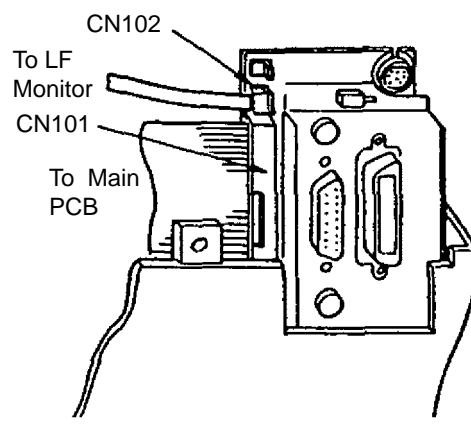
- Remedied?

YES

NO

- Replace the LF motor. (See Section 3.3.10)
- After the LF motor replacement, belt tension adjustment is necessary. (See Section 4.5.)

- End



⑦ Malfunction of switch on operation board

- Is cable CN1 on the operation board connected correctly?

YES**NO**

- Connect it correctly.

- Is cable CN10 on the control board connected correctly?

YES**NO**

- Connect it correctly.

- Replace the operation board. (See Section 3.3.5.)

- Remedied?

YES**NO**

- Replace the control board. (See Section 3.3.7.)

- End

⑧ Data receiving failure

- Is select lamp blinking?

NO **YES**

- Set menu to ignore DC3.(Print Suppress)

- Is the alarm lamp on?

NO **YES**

- To Step ⑧-1

- Is the SELECT lamp on?

YES **NO**

- Set to the SELECT mode.

- Is the interface cable connected correctly?

YES **NO**

- Connect it correctly.

- Is cable CN101 on the interface connector board connected correctly?(See figure below.)

YES **NO**

- Connect it correctly.

- Is cable CN6 on the Control board connected correctly?

YES **NO**

- Connect it correctly.

- Branch the search path depending on whether the interface is parallel or serial.

Parallel interface Serial interface

- Correctly set the interface menu parameters.

- Baud rate

- Character format

- Protocol

- Busy signal polarity 1

- Remedied?

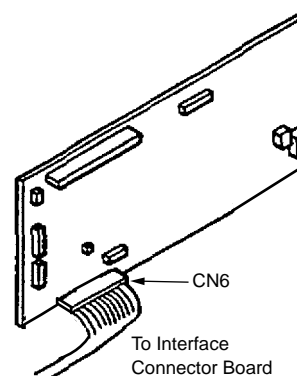
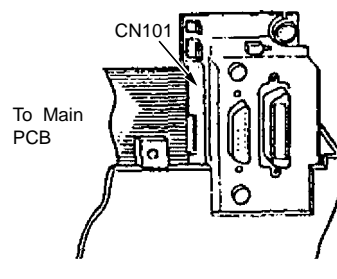
NO **YES**

- End

- Replace the power supply unit.(See Section 3.3.20.)

- To Step ①

- To Step ①



- ④ • Replace the control board. (See Section 3.3.7.)

- Remedied?

YES

NO



- Replace the interface connector board. (See Section 3.3.6.)
Check shorting plugs.
- Replace the cable connected to CN6 on the control board.

- End

8-1

- Remove the upper cover (See section 3.3.4.), and turn on the power with one hand while pressing the cover open microswitch with the other hand.

- Does the alarm lamp come on?

YES

NO

- Correctly connect cable CN13 on the control board.
- Check the corresponding between the front access cover and cover open lever.
- Replace the cover open microswitch cable assembly.

- Is the paper set?

YES

NO

- Set the paper.

- Does the continuous form end microswitch function correctly?

YES

NO

- Correctly connect CN103 on the interface connector board.
- Replace the push tractor assembly (L). (See Section 3.3.18.)

- Does the single push tractor assy function correctly?

YES

NO

- Check that there is no dirt or dust on the sensor surface.
- Correctly connect CN1 on the sensor board.
- Replace the sensor cable assembly.

- Does the bottom paper end sensor function correctly?

YES

NO

- Check that there is no dirt or dust on the sensor board.
- Correctly connect cable CN3 on the sensor board.
- Correctly connect cable CN4 on the control board.
- Replace the sensor board. (See Section 3.3.12.)

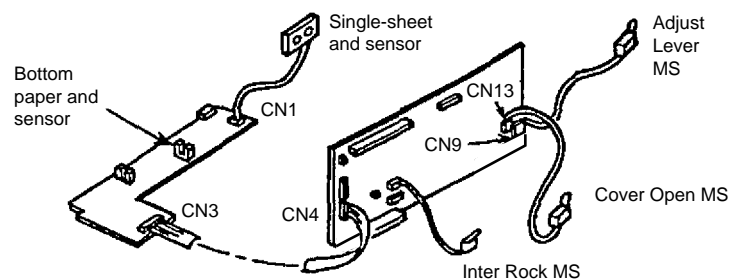
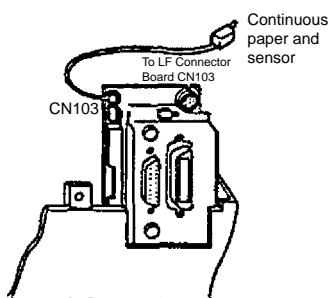
- Does the release lever microswitch function correctly?

YES

NO

- Correctly connect cable CN9 on the control board.
- Replace the release lever, microswitch and cable assembly.

- Replace the control board. (See Section 3.3.7.)



⑨ Color ribbon change trouble

- No change operation?

YES

NO

- To step 9-2

- Is black ribbon set on the menu?

NO

YES

- Set another color.
- Remedied?

NO

YES

- END
- To Step ⑩

- ⑩ • Are CN4 on the control board and CN2/CN3 on the sensor board connected correctly?

YES

NO

- Connect the cables correctly.
- Remedied?

NO

YES

- End
- To Step 9-1

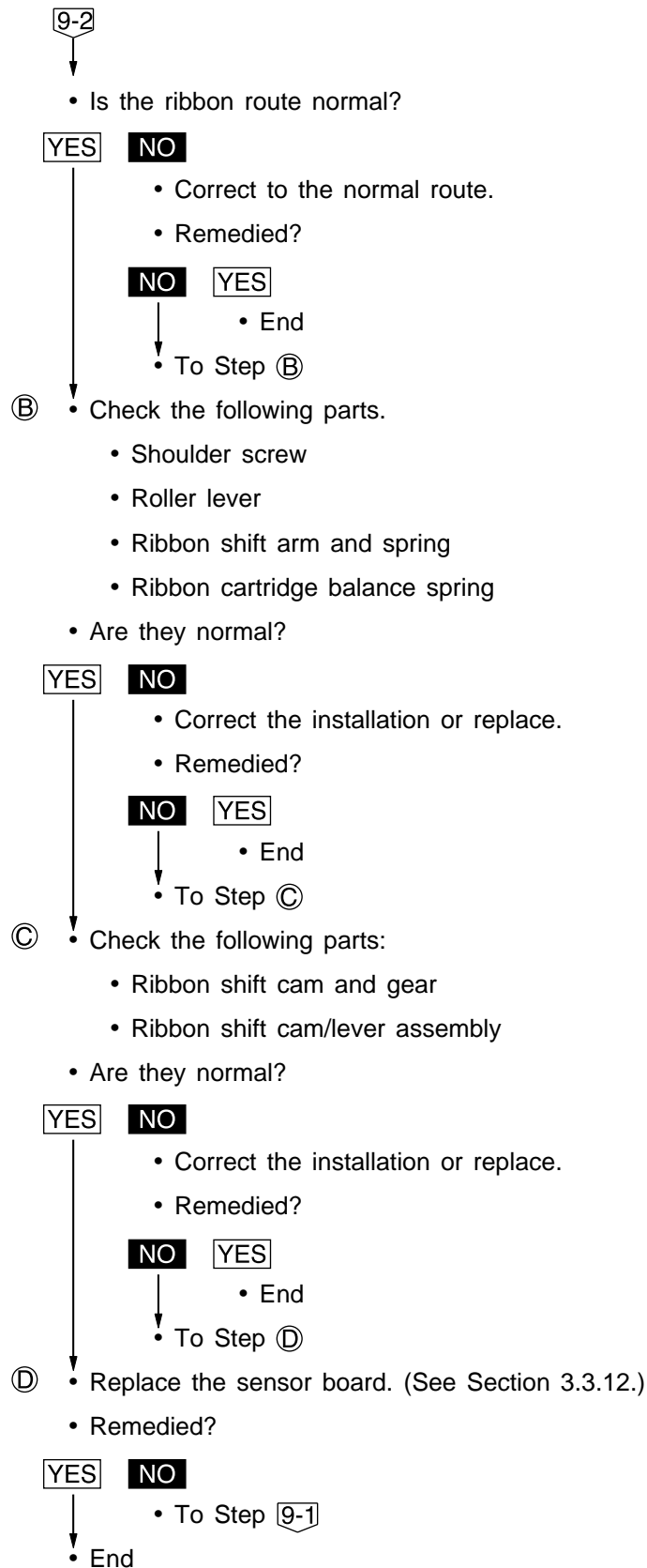
9-1

- Replace the control board. (See Section 3.3.7.)
- Remedied?

YES

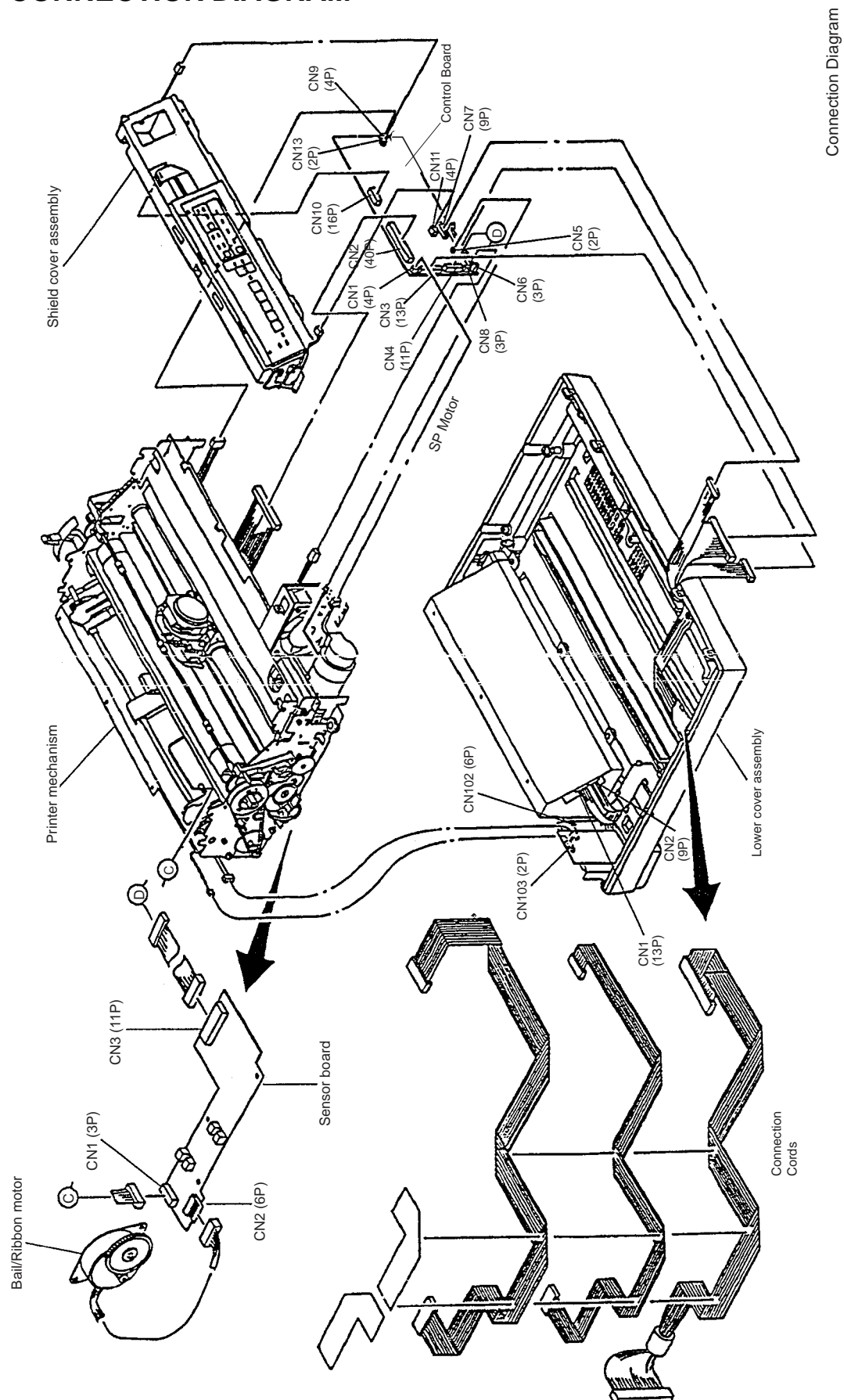
NO

- Replace the ribbon/bail motor assembly. (See Section 3.3.16.)
- End



APPENDIX A

1. CONNECTION DIAGRAM



APPENDIX B. MENU SELECTION

1. OVERVIEW:

Access “global” type printer features/functions directly as possible. Features selected in MENU mode become the default features for the printer each time it is powered on. The Menu function allows the ability to activate features without the use of software commands. Software commands will override MENU settings.

2. KEY FUNCTIONS:

<u>Key Name</u>	<u>Function</u>
GROUP	General categorization of functions/features. Selects next GROUP title, once through the entire list, loops back to the first GROUP.
ITEM	Direct name of functions/features. Selects next ITEM title, one through the entire list, loops back to the first ITEM in the current GROUP.
SET	Value (setting) of the ITEM. Selects next SETTING value, one through the entire list, loops back to the beginning of the list.
PRINT	Prints entire MENU and returns to top of MENU list.

3. OPERATION

1. To enter Menu mode depress QUIET switch.
 - a. Printer = deselected state. SEL LED = off
 - b. Press GROUP switch to print first MENU item.
2. Upon entering Menu mode, the first GROUP - ITEM - SET is printed.
3. See Key functions above for description of operation.
4. To exit MENU mode depress the SEL switch.
5. If conflicting functions are set in menu mode, the printer will treat these functions according to the priority table.
6. The TOF position is not affected by MENU mode.
7. Depressing TOF/SEL switches simultaneously on power up will reset the menu back to its factory settings. (see FACTORY SETTINGS for further details.)

Note 1. When entering/exiting Menu mode, the user is not prompted.

2. DLL data will not be lost after exiting from menu except when emulation mode is changed.

4. TABLE OF MENU SELECTIONS

Table of Menu Selections for ODA

*: Set at the shipping from a factory

Group	Item	Sets
Printer Control	Emulation Mode	EPSON LQ* IBM PPR IBM X24 AGM
Font	Print Mode	LQ* NLQ Utility HSD
	Typestyle	Courier* Roman Swiss Orator DLL
	Pitch	10 CPI* 12 CPI 15 CPI 17.1 CPI 20 CPI Proportional
	Style	Normal* Italics
	Size	Single* Double Triple
	Smoothing	No* Yes
General Control	Graphics	Uni-directional* Bi-directional
	Paper Out Override	No* Yes
	Print Registration	+5 +4 +3 +2 +1 0* -1 -2 -3 -4 -5
	Operator Panel Functions	Full Operation* Limited Operation
	Ribbon Selection	Black Ribbon* Film Ribbon
	Ribbon Selection (ML395C only)	Magenta* Cyan Violet Orange Green Black Ribbon Film Ribbon Black Yellow

Group	Item	Sets
General Control	Reset Inhibit	No* Yes
	Page Width	13.6"* 8"
	Auto LF	No* Yes
	Auto CR (IBM)	No* Yes
	Form Tear-Off	Off* 300 ms 2 sec 4 sec Offline 300 ms (ML393PLUS) 1 sec (ML393PLUS) 2 sec (ML393PLUS)
	Menu Line	6* 1
Rear Feed	Line Spacing	6 LPI* 8 LPI
	Skip Over Perforation	No* Yes
	Page Length (Inches)	12" 11"* 11 2/3" 14" 17" 3" 3.5" 4" 5.5" 6" 7" 8" 8.5"
Bottom Feed	Line Spacing	6 LPI* 8 LPI
	Skip Over Perforation	No* Yes
	Page Length (Inches)	12" 11"* 11 2/3" 14" 17" 3" 3.5" 4" 5.5" 6" 7" 8" 8.5"
Cut Sheet	Line Spacing	6 LPI* 8 LPI

Group	Item	Sets
Cut Sheet	Page Length	12" 11"* 11 2/3" 14" 17" 3" 3.5" 4" 5.5" 6" 7" 8" 8.5"
	Paper/Transparency	Paper* Transparency
	Page Length Control	by MENU Setting* by Actual Page Length
Symbol Sets	Character Set	Set II Set I * EPSON
	Code Page	USA* Canada-French Multilingual
	Language Set	American * French German British Danish I Swedish Italian Spanish I Japanese Norwegian Danish II Spanish II Latin American French Canadian Dutch Publisher
	Zero Character	Unslashed Slashed*
General Interface	Max Receive Buffer	1 Line 8K* 23K 40K(Optional)
	Print Suppress Effective	No Yes*
	Auto Feed XT (EPSON)	Invalid Valid*
	CPU Compensation	Standard* Special
Serial Interface	Parity	None* Odd Even

Group	Item	Sets
Serial Interface	Serial Data 7/8 Bits	8* 7
	Protocol	Ready/Busy* X-ON/X-OFF
	Diagnostic Test	No* Yes
	Busy Line	SSD-* SSD+ DTR RTS
	Baud Rate	19200 BPS 9600 BPS* 4800 BPS 2400 BPS 1200 BPS 600 BPS 300 BPS
	DSR Signal	Valid* Invalid
	DTR Signal	Ready on Power UP* Ready on Select
	Busy Time	200 ms* 1 sec

Table of Menu Selections for AOS1

*: Set at the shipping from a factory

Group	Item	Sets
Printer Control	Emulation Mode	EPSON LQ* IBM PPR IBM X24 AGM
Font	Print Mode	LQ* NLQ Utility HSD
	Typestyle	Courier* Swiss Swiss Bold Roman Letter Gothic Prestige Elite
	Pitch	10 CPI* 12 CPI 15 CPI 17.1 CPI 20 CPI Proportional
	Style	Normal* Italics
	Size	Single* Double Triple
	Smoothing	No* Yes
General Control	Graphics	Uni-directional* Bi-directional
	Paper Out Override	No* Yes
	Print Registration	+5 +4 +3 +2 +1 0* -1 -2 -3 -4 -5
	Operator Panel Functions	Full Operation* Limited Operation
	Ribbon Selection (ML395C only)	Magenta* Cyan Violet Orange Green Black Ribbon Film Ribbon Black Yellow

Group	Item	Sets
General Control	Reset Inhibit	No* Yes
	Page Width	13.6"* 8"
	Auto LF	No* Yes
	Auto CR (IBM)	No* Yes
	Form Tear-Off	Off* 300 ms 2 sec 4 sec Offline
	Menu Line	6* 1
Rear Feed	Line Spacing	6 LPI* 8 LPI
	Skip Over Perforation	No* Yes
	Form Length Base	Inches* Lines
	Page Length (Inches)	12"* 11" 11 2/3" 14" 17" 3" 3.5" 4" 5.5" 6" 7" 8" 8.5"
	Page Length (Lines*100)	0* 1
	Page Length (Lines*10)	0 1 2 3 4 5 6 7* 8 9
	Page Length (Lines*1)	0 1 2* 3 4 5 6 7 8 9

Group	Item	Sets
Bottom Feed	Line Spacing	6 LPI* 8 LPI
	Skip Over Perforation	No* Yes
	Form Length Base	Inches* Lines
	Page Length (Inches)	12"* 11" 11 2/3" 14" 17" 3" 3.5" 4" 5.5" 6" 7" 8" 8.5"
	Page Length (Lines*100)	0* 1
	Page Length (Lines*10)	0 1 2 3 4 5 6 7* 8 9
	Page Length (Lines*1)	0 1 2* 3 4 5 6 7 8 9
Cut Sheet	Line Spacing	6 LPI* 8 LPI
	Page Length	12" 11" 24"* 14" 16.57" 3" 3.5" 4" 5.5" 6" 7" 8" 8.5"

Group	Item	Sets
Symbol Sets	Character Set	Set II * Set I EPSON
	Code Page	USA* Multilingual Portugal Norway Turkey
	Language Set	ASCII * French German British Danish I Swedish I Italian Spanish I Japanese Norwegian Danish II Spanish II Latin American French Canadian Dutch Swedish II Swedish III Swedish IV Turkish Swiss I Swiss II Publisher
	Zero Character	Unslashed* Slashed
	Slashed Letter 0	No* Yes
General Interface	Max Receive Buffer	1 Line 8K* 23K 40K(Optional)
	Print Suppress Effective	No Yes*
	Auto Feed XT (EPSON)	Invalid* Valid
	CPU Compensation	Standard* Special
Serial Interface	Parity	None* Odd Even
	Serial Data 7/8 Bits	8* 7
	Protocol	Ready/Busy* X-ON/X-OFF
	Diagnostic Test	No* Yes
	Busy Line	SSD-* SSD+ DTR RTS

Group	Item	Sets
Serial Interface	Baud Rate	19200 BPS 9600 BPS* 4800 BPS 2400 BPS 1200 BPS 600 BPS 300 BPS
	DSR Signal	Valid* Invalid
	DTR Signal	Ready on Power UP* Ready on Select
	Busy Time	200 ms* 1 sec

Table of Menu Selections for OEL

*: Set at the shipping from a factory

Group	Item	Sets
Printer Control	Emulation Mode	EPSON LQ* IBM PPR IBM X24 AGM
Font	Print Mode	LQ* NLQ Utility HSD
	Typestyle	LQ Courier* LQ Roman LQ Swiss LQ Swiss Bold LQ OCR-A LQ OCR-B LQ Orator LQ Gothic LQ Prestige
	Pitch	10 CPI* 12 CPI 15 CPI 17.1 CPI 20 CPI Proportional
	Style	Normal* Italics
	Size	Single* Double Triple
	Smoothing	No* Yes
General Control	Graphics	Uni-directional* Bi-directional
	Paper Out Override	No* Yes
	Print Registration	+5 +4 +3 +2 +1 0* -1 -2 -3 -4 -5
	Operator Panel Functions	Full Operation* Limited Operation
	Ribbon Selection (ML395C only)	Magenta* Cyan Violet Orange Green Black Ribbon Film Ribbon Black Yellow

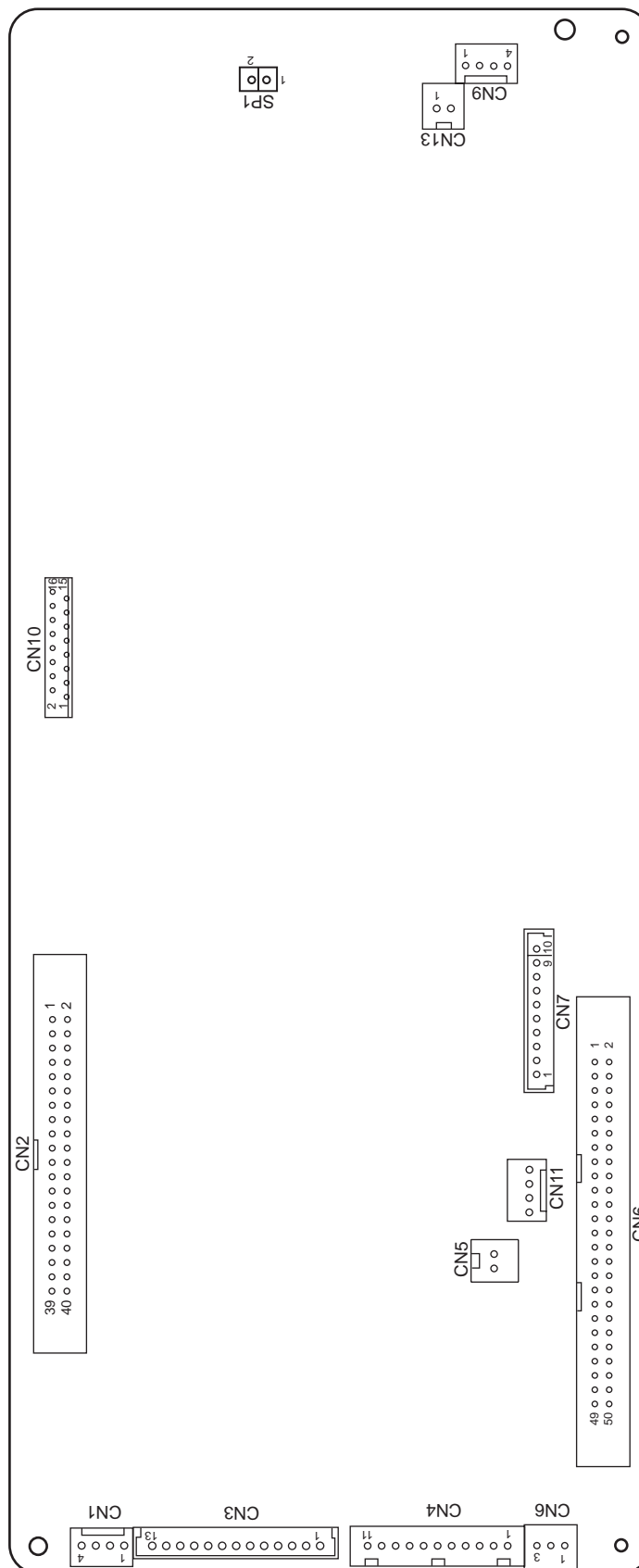
Group	Item	Sets
General Control	Reset Inhibit	No* Yes
	Page Width	13.6"* 8"
	Auto LF	No* Yes
	Auto CR (IBM)	No* Yes
	Form Tear-Off	Off* 300 ms 2 sec 4 sec Offline
	Menu Line	6* 1
Rear Feed	Line Spacing	6 LPI* 8 LPI
	Skip Over Perforation	No* Yes
	Form Length Base	Inches* Lines
	Page Length (Inches)	12"* 11" 11 2/3" 14" 17" 3" 3.5" 4" 5.5" 6" 7" 8" 8.5"
	Page Length (Lines*100)	0* 1
	Page Length (Lines*10)	0 1 2 3 4 5 6 7* 8 9
	Page Length (Lines*1)	0 1 2* 3 4 5 6 7 8 9

Group	Item	Sets
Bottom Feed	Line Spacing	6 LPI* 8 LPI
	Skip Over Perforation	No* Yes
	Form Length Base	Inches* Lines
	Page Length (Inches)	12"* 11" 11 2/3" 14" 17" 3" 3.5" 4" 5.5" 6" 7" 8" 8.5"
	Page Length (Lines*100)	0* 1
	Page Length (Lines*10)	0 1 2 3 4 5 6 7* 8 9
	Page Length (Lines*1)	0 1 2* 3 4 5 6 7 8 9
Cut Sheet	Line Spacing	6 LPI* 8 LPI
	Page Length	12" 11" 11 2/3"* 14" 16.57" 3" 3.5" 4" 5.5" 6" 7" 8" 8.5"

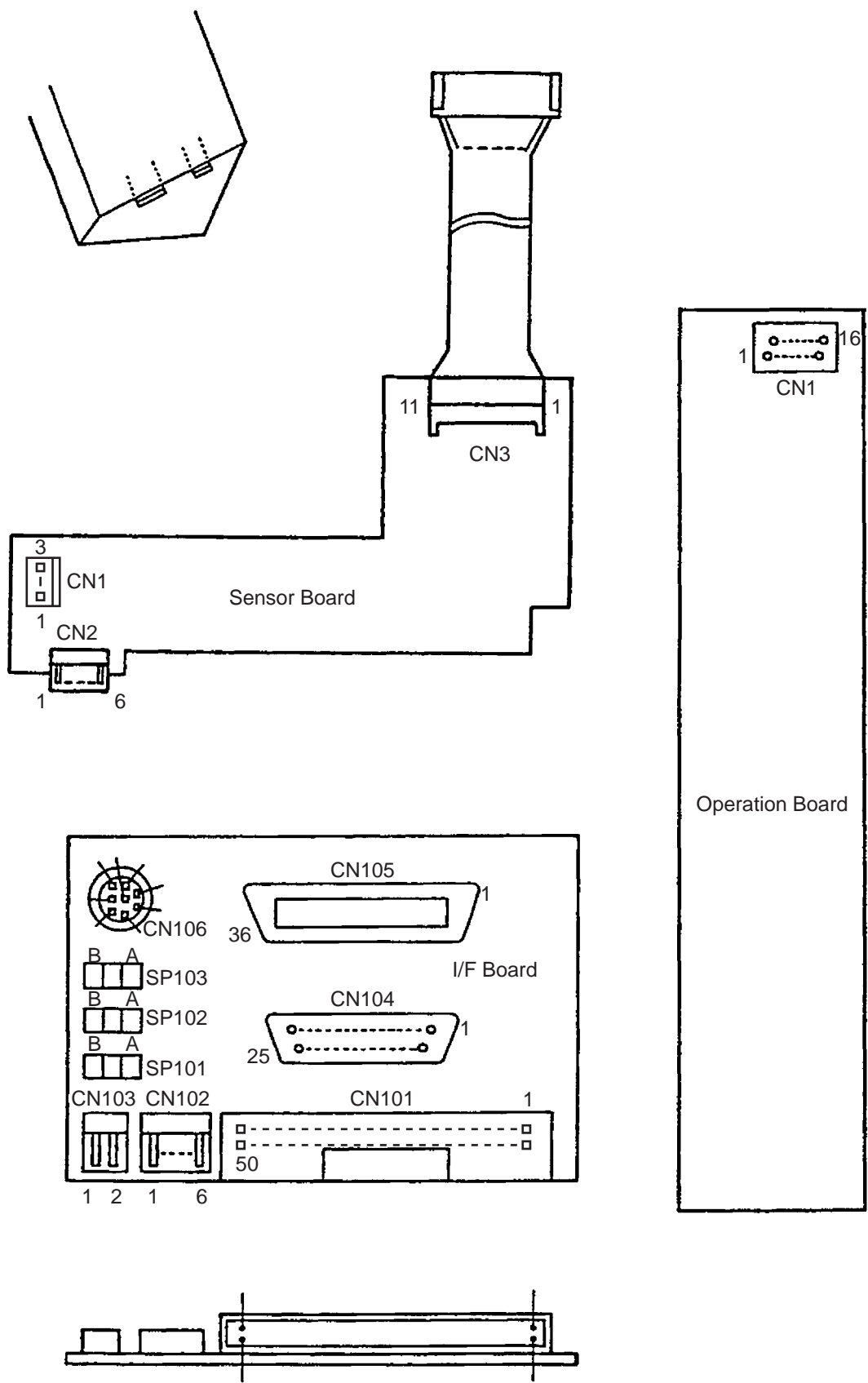
Group	Item	Sets
Symbol Sets	Character Set	Set II * Set I EPSON
	Code Page	USA* Canada French Multilingual Portugal Norway Turkey Greek_437 Greek_869 Greek_928 Greek_437 CYPRUS Polska Mazovia Serbo Croatic I Serbo Croatic II ECMA-94 Hungarian CWI Windows Greek Windows East Europe Windows Cyrillic East Europe Latin II - 852 Cyrillic I - 855 Cyrillic II - 866 Kamenicky (MJK) ISO Latin 2 Hebrew NC (862) Hebrew OC Turkey_857 Latin 5 (Windows Turkey) Windows Hebrew Ukrainian Bulgarian ISO Latin 6 (8859/10) Windows Baltic Baltic_774 KBL-Lithuanian Cyrillic Latvian Roman-8 Icelandic-861 Multilingual-858 ISO 8859/15 Greek_737
	Language Set	ASCII * French German British Danish I Swedish I Italian Spanish I Japanese Norwegian Danish II Spanish II Latin American French Canadian Dutch Swedish II Swedish III Swedish IV Turkish Swiss I Swiss II Publisher

Group	Item	Sets
Symbol Sets	Zero Character	Unslashed* Slashed
	Slashed Letter 0	No* Yes
General Interface	Max Receive Buffer	1 Line 8K* 23K 40K(Optional)
	Print Suppress Effective	No Yes*
	Auto Feed XT (EPSON)	Invalid* Valid
	CPU Compensation	Standard* Special
Serial Interface	Parity	None* Odd Even
	Serial Data 7/8 Bits	8* 7
	Protocol	Ready/Busy* X-ON/X-OFF
	Diagnostic Test	No* Yes
	Busy Line	SSD-* SSD+ DTR RTS
	Baud Rate	19200 BPS 9600 BPS* 4800 BPS 2400 BPS 1200 BPS 600 BPS 300 BPS
	DSR Signal	Valid* Invalid
	DTR Signal	Ready on Power UP* Ready on Select
	Busy Time	200 ms* 1 sec

5. CONNECTOR PIN AND SHORTING PLUG ARRANGEMENT



Setting of SP1
Open : Sets the printer for exclusive use of black ribbon
Short : Sets the printer for color model



6. SHORTING PLUG FUNCTION TABLE

The settings of shorting plugs are shown below.

Setting Shorting plug		<div> <div>A</div> <div>B</div> <div> <div></div> <div></div> <div></div> </div> </div> Set to A side		<div> <div>A</div> <div>B</div> <div> <div></div> <div></div> <div></div> </div> </div> Set to B side	
I/F-Board	SP 101	AUTO FEEDXT signal of Centronics I/F is made valid.		AUTO FEEDXT signal of Centronics I/F is made invalid.	
	SP 102	I-PRIME signal of Centronics I/F is made invalid.		I-PRIME signal of Centronics I/F is made valid.	
	SP 103	+5 V is output to pin 18 of Centronics I/F.		+5 V is not output to pin 18 of Centronics I/F.	
Control-Board	SP1	Open	Sets the printer for Monochrome model	Short	Sets the printer for Color model.